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Syllabus

TECHNOLOGY FOR HIGHER EDUCATION

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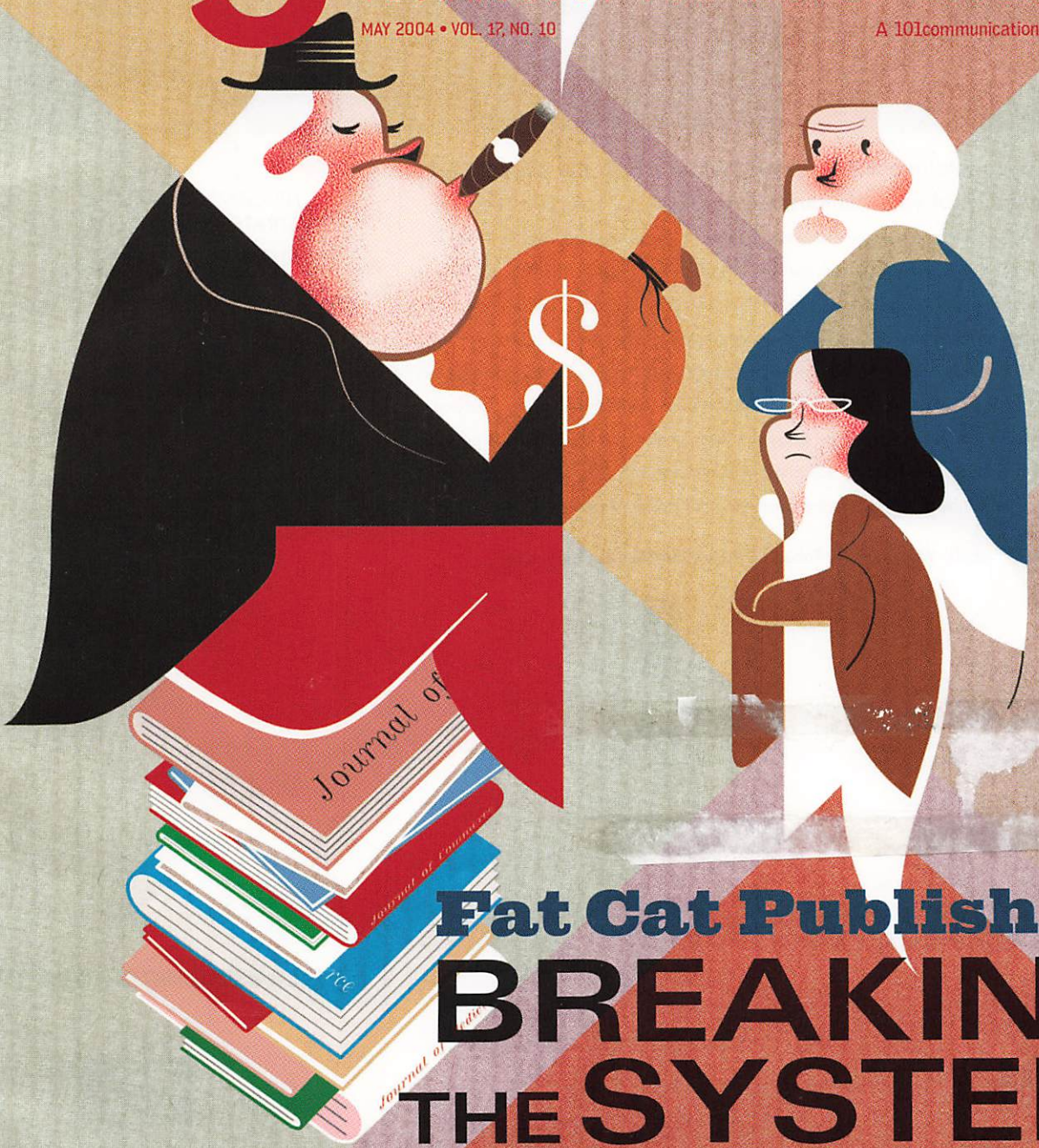
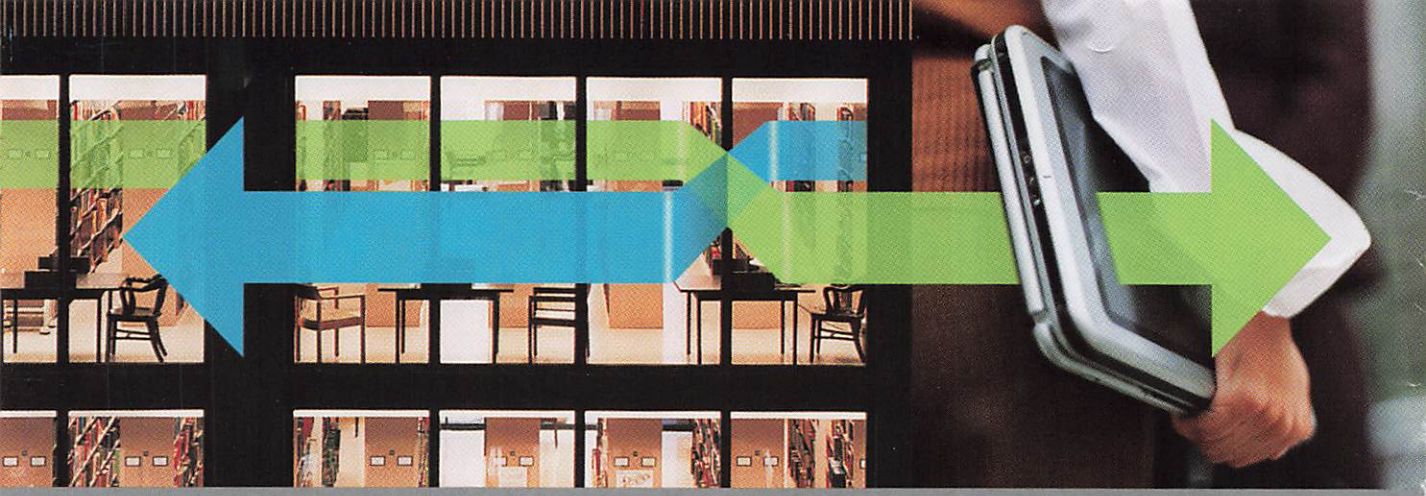


Fat Cat Publishers

BREAKING THE SYSTEM

Academia Confronts the High Cost of Scholarly Publications

BUILDING THE DIGITAL LIBRARY • eSCHOLARSHIP REPOSITORIES • DIGITAL IMAGE SERVICES



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EDITOR'S NOTE

Mary Grush, Editor

In this issue, several articles explore the key technologies and issues surrounding digital libraries, covering an array of topics, from eScholarship repositories, to digital image collections and services, to reusable content objects, to infrastructure planning and the expanding role of libraries. But if I were to identify a common thread, it would be the direct efforts to empower users. All the amazing technologies and implementation strategies you'll read about are pointed squarely at providing service, and the firm commitment of all those involved is palpable.

Right now, there is no stronger voice in the digital library realm than that of the eScholarship initiative at the California Digital Library. In our lead feature article, "Fat Cat Publishers: Breaking the System" (page 10), Catherine Candee provides a measured but very straightforward account of CDL's efforts to facilitate affordable scholarly communications, before the spiraling costs of print journals and monographs prohibit the exchange of scholarly materials entirely. The system is broken—already some authors are not published—but digital repositories promise to improve the picture dramatically, not only with an alternative economic model, but with service enhancements not possible in the print world.

At Duke University, the digital library has been recognized as a key component in the university's strategic planning process. In "Deep Infrastructure Supports Digital Library Services" (page 19), Paul Conway writes that "Duke's digital library program becomes the essential mechanism for uniting people and ideas and presenting information that lives across the full spectrum of storage media." It's notable that physical infrastructure is considered as it relates to digital libraries, so library buildings and "inviting spaces where people can learn together" are carefully thought out in relation to digital library services. The digital library will both provide access to resources and have a central role in all aspects of the evolving academic environment on campus.

Digital images can enhance course materials and Web publications, but many individuals find them cumbersome because of concerns about the technology, image quality, copyright issues, classroom provisions, and other related issues. A pioneer in all things digital, the CDL has stepped up to the plate once again, and is working on problems from file formats to classroom readiness. In "Digital Images Come of Age" (page 29), Laine Farley provides a status on CDL's Image Demonstrator Project and efforts to standardize and improve the management of digital collections and delivery of digital images. Farley will be a presenter at the Syllabus2004 annual summer conference.

I hope you are making plans to attend Syllabus2004, July 18-22 in downtown San Francisco, including a one-day excursion across the bay to the UC-Berkeley campus. See page 21 for basic conference information, and visit our Web site (www.syllabus.com) for complete conference information and registration options.

Enjoy this issue of *Syllabus*!

Mary Grush

Letters to the editor should be addressed to the editor and sent to 101 First Street, #605, Los Altos, CA 94022, or via electronic mail (mgrush@syllabus.com). We reserve the right to edit all submissions. **News and product information** will be considered for publication. Please send all materials to Paul McCloskey. If you are interested in writing for *Syllabus*, please send a brief description of your article idea along with writing samples to the editor at the above address.

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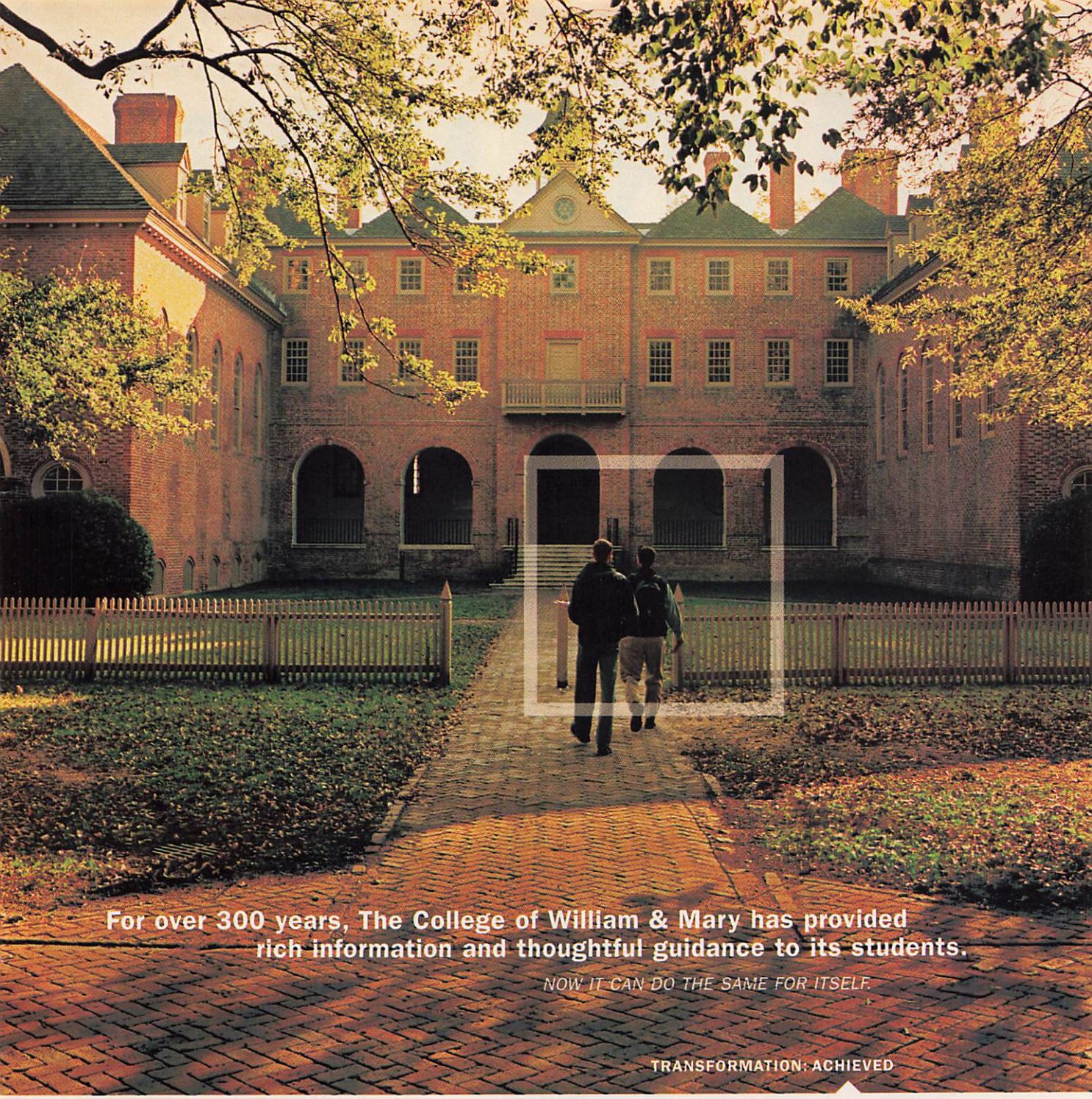
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TRENDS

AN INFORMATION RESOURCE OF INTEREST TO EDUCATORS

Learning Object Repositories, Digital Repositories, and the Reusable Life of Course Content

Course management systems have gone mainstream. If your college doesn't have one, it will. Richard Katz, director of the EDUCAUSE Center for Applied Research (ECAR), describes this as an evolution from "...small, often sub-rosa tools used by quirky faculty to streamline efforts or to illustrate points with students in new and novel ways..." [*Educause Review*, July/August 2003] to a dominant component of today's education technology landscape. Thousands of faculty are creating content and putting them in CMSes. They've worked hard to create new digital learning exercises or convert problem sets and lecture notes to digital format. The products of these efforts are now scattered on the hard drives of faculty computers and the representations of the online courses they teach.

Because the work to produce online learning objects is more visible, often involves effort beyond that which would have been expended to prepare traditional course content, and frequently engages more people, its value has appreciated over its former paper-and-chalk-board counterparts. Managing these pieces of digital course content so they don't have to be recreated every term and can be reused by faculty has increasing appeal.

Most course management systems began with some form of content management. Usually they provide a means of moving content from one instantiation of a course to another. Getting the content out so that it can be used elsewhere, in another system, for example, is another matter. However, as CMSes have proliferated, so have the issues surrounding the management of the materials faculty prepare for their courses.

Institutional Repositories

California Digital Library eScholarship Repository
http://repositories.cdlib.org/
(last accessed March 29, 2004)

DSpace - a digital library system to capture, store, index, preserve, and redistribute the intellectual output of a university's research faculty in digital formats.
http://dspace.org
(last accessed March 29, 2004)

The Fedora Project,
An Open-Source Digital Repository Management System
http://www.fedora.info/
(last accessed March 29, 2004)

The Intersection of Information Services and Learning Content

The suppliers' interests traditionally organize the resources created by faculty, acquired by libraries, and purchased from information vendors. They are stored and managed in systems that require distinct access characteristics, usually include different logins, and are structured in different ways, making it difficult to exchange content among them. They are conceived and designed as stand-alone systems instead of parts of a cohesive information resource fabric. Rarely are course management systems organized to maximize scholarly or pedagogical value, let alone configured to align with user preferences.

The situation is rapidly becoming more complex. The list of places vying to provide a home for "learning content" is expanding. Besides course management systems and library-managed institutional repositories (e.g., Fedora and DSpace), digital learning materials may find themselves in Web server file directories, content management systems (e.g., Zope), enterprise file systems (e.g., OpenAFS), and newly emerging learning object repositories (see representatives in the ADL Directory of Learning Object Repositories, or the University of Texas LOR Directory).

The current linkages between library systems and course management systems are weak. Students may have URL links in their CMS to a library system to get content they need for their course, usually having to login to the library system in the process. To put content into their CMS-based course, both students and faculty generally have to create or independently find and upload the digital content into the CMS. This leaves little opportunity to interact with digital content and the learning activity (encapsulated in modules of learning objects) dynamically.

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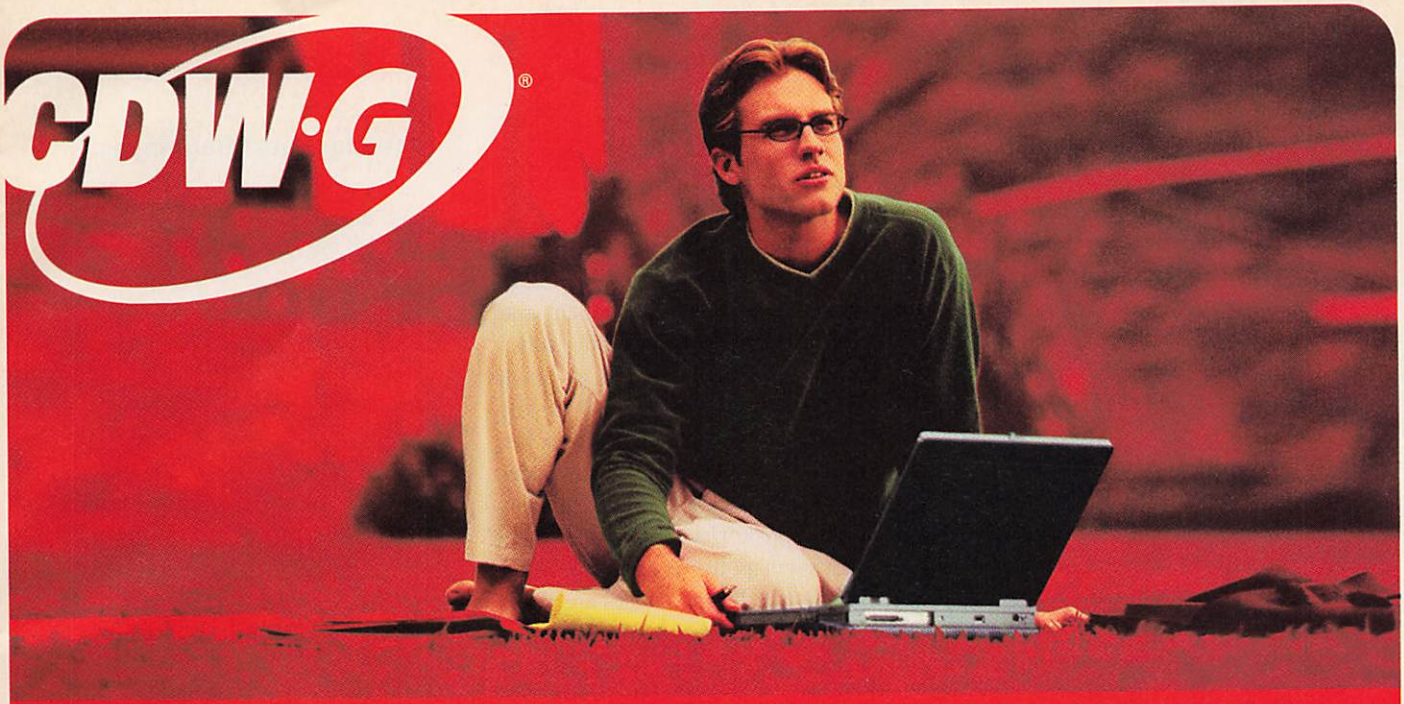

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to bring content from libraries into CMSes. The learner perspective, however, has been largely neglected. What do learners need? They should be able to draw on digital assets from any resource, or repository, that strikes them as useful—even if the rationale is serendipity—at the exact moment when the learning activity calls for it. Today they can't do that.

Lightweight Digital Assets and Heavyweight Stewardship

Libraries tend to view their responsibility toward managing digital repositories with robust, call them heavyweight policy guidelines. There are rules about who can put things into the library repositories, what metadata is required for submitted content, acceptable formats, and the implications of these formats on the library's ability to guarantee that they'll be there and accessible years later.

While there are a few institutional digital repository projects (e.g., the California Digital Library eScholarship Repository, along with DSpace and Fedora, previously mentioned), there is a rapid proliferation of lightweight digital repositories (DR-Lite). These are learning object repositories (see sidebar) holding ephemeral learning assets that characterize the majority of what faculty and students use in online learning environments.

By referring to these materials as ephemeral, I don't mean to diminish their value or the work that went into their creation. Nevertheless, from the library perspective they aren't permanent and therefore are typically treated differently.

Learning is loosely guided, as much directed by the learner as it is by the intentions of the teacher. Therein lies the problem. Effective course management systems will need to access multiple repositories (which will likely have different policy frameworks) and determine which repositories are available and for what purposes they can be used. The interactions among library repositories, learning object repositories, and course systems are rife for misunderstandings of language, policy, and purpose.

Content Lifecycles

Complex problems are like ecosystems. Understanding ecosystem dynamics provides a window into their behavior, the process cycles, and the flow of critical nutrients that sustain them. In this case, one critical indicator can help illuminate the problem: to examine how digital content is created, organized, and managed throughout its lifecycle.

This ecosystem view cuts across the boundaries between library and eLearning communities. The islands of content have little migration or emigration. To establish pathways among them requires attention to both the functional and technical attributes of their systems. The challenge is to take a step back and look beyond the subsystems. All components of the ecosystem must follow common rules. This analogy suggests that institutional infrastructure must share functional and technical services. Information system services are made of components like authorization, authentication, group management, and digital repository communications.

Only by taking a step back and expanding the scope of the system can we start to see it as made up of components that share services rather than idiosyncratically using their own. It's time to look at learning content lifecycles to gain a new understanding of eLearning and library co-existence.

For more resources go to: www.syllabus.com/trends

Learning Object Definitions

"...a learning object is defined as any entity, digital or non-digital, that may be used for learning, education, or training."

From IEEE P1484.12.1/D6.4, "Draft Standard for Learning Object Metadata." http://ltsc.ieee.org/doc/wg12/LOM_WD6_4.pdf

Dalziel (2002) describes a learning object as "an aggregation of one or more digital assets, incorporating metadata, which represents an educationally meaningful stand-alone unit."

The JORUM+ project adopted the following definition: "A learning object is any resource that can be used to facilitate learning and teaching that has been described using metadata."

Learning Object Repositories

ADL - Directory of Learning Object Repositories
http://projects.aadlcolab.org/repository-directory/repository_listing.asp

Belts Project - The Basic eLearning Tool Set (BELTS) has been developed by The Le@rning Federation (TLF) to demonstrate the distribution, management, and use of learning objects and to aid investigation of requirements for eLearning environments by Australian and New Zealand school jurisdictions. http://belts.sourceforge.net/

Intrallect: Intralibrary learning object management system,
http://www.intrallect.com/index.htm

Jorum+ Learning object repository project. The Joint Information Systems Committee. http://www.jorum.ac.uk/

The Learning Federation - The Le@rning Federation is an initiative of State and Federal governments of Australia and New Zealand. Over the period 2001-2006 the Initiative aims to develop online interactive curriculum content specifically for Australian and New Zealand schools.
http://www.thelearningfederation.edu.au/tlf/newcms/d2.asp

University of Texas LOR Directory
http://elearning.utsa.edu/guides/LO-repositories.htm

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Fat Cat Publ

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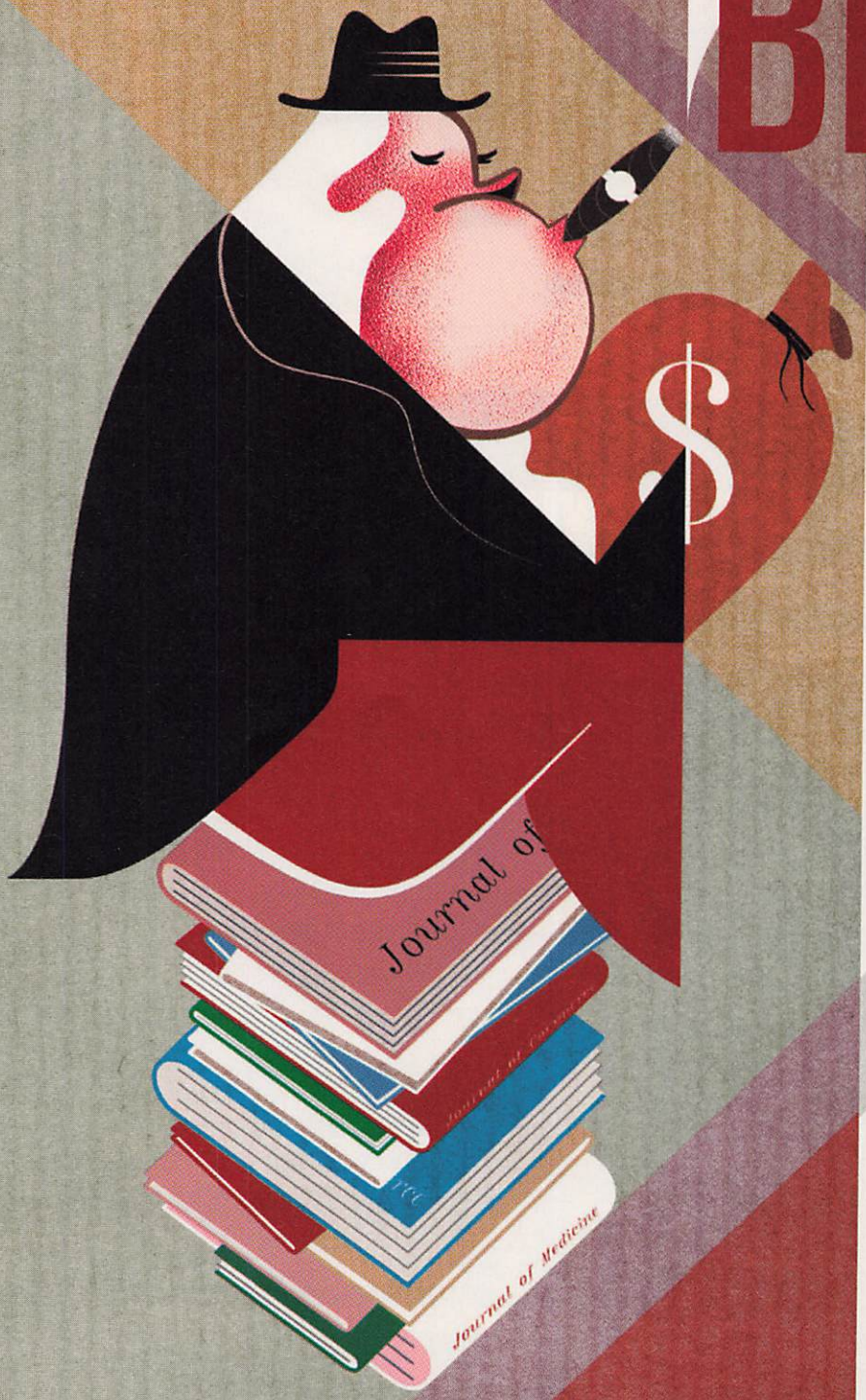


The scholarly publishing system is broken. At research universities everywhere, scholarly work—in the form of articles, books, editing, reviewing of manuscripts—is handed over to commercial publishers, only to be bought back by the libraries at huge cost. Libraries scramble to judiciously stretch shrinking budgets for growing runs of books and journals—books and journals that are critical to the research and teaching activities of the university's faculty who, as authors and editors, contribute so generously to the publishers who sell them. The arrangement is bankrupting research library budgets and swelling the profit margins of commercial publishers.

ishers NG THE SYSTEM

By Catherine Candee
California Digital Library, University of California

scholarly publications have fueled new digital repository initiatives.

Sadly, commercial publishing threatens the very system it exists to support. When expensive commercially published materials cannot be bought, when university presses cannot afford to publish monographs for junior faculty, everyone suffers. Students and scientists cannot gain access to badly needed materials; scholars cannot get tenure for lack of that first published monograph. The modern university, modeled on the ideal of the Greek temple where thinkers and learners pursued knowledge so that society could reap its benefits, is losing ground to crass commercialism. At risk is the very culture of the academy.

Universities are committed to safeguarding the treasures created and used by their communities. Most started years ago to explore digital technologies that could extend institutional capacity, through libraries and academic computing departments, to support their core mission—teaching and research. After decades of eroded purchasing power, most university libraries ran out of tricks and faculty and researchers began to feel the pinch. Now, universities are acting in concert to develop a sustainable system that would enable all institutions of higher education to meet the challenge of 21st century learning and scholarship. One of these is the University of California (UC).

Enter the California Digital Library

UC charged onto the scene in 1997 with the formation of its California Digital Library (CDL), which has become one of the largest digital libraries in the world. CDL's mission is to support the assembly and creative use of the world's scholarship by harnessing technology and innovation, and by leveraging the intellectual and cultural resources of the University of California.

eScholarship, CDL's programmatic vehicle for experimentation in scholarly publishing, got cracking in response to faculty need for dissemination and publishing tools and services. The wildly popular eScholarship Repository, an open access system at the heart of the initiative, offers UC faculty a central, online location for everything from technical reports to peer-reviewed journals and edited volumes. In slightly less than two years, the repository has seen almost 500,000 full-text downloads, i.e., downloads of entire papers or articles.

The program seeks to demonstrate a reliable and sustainable model as part of the effort to improve all areas of scholarly communication—creation, peer review, management, dissemination, and preservation.

A System Based on Faculty Need

The eScholarship program began with the notion of "scholar-led innovations in scholarly communication." We at the CDL spent two years investigating, exploring, and mapping the expressed needs of UC faculty, students, and researchers and we struggled to reconcile contradictory needs: short-term ("I need it now, no matter the cost!") and long-term ("We must invest in a sustainable publishing system"). We learned that change would need to come on many fronts—policy, organizational, technical, behavioral, and attitudinal—and that UC's efforts must span them all.

We also realized that, though many faculty were interested in the possibilities for change,

most were not as ready for true innovation as we had hoped...and they were all very busy. The most universal concerns turned out to be quality, i.e., peer review, recognition, permanence, and time.

In order to at least replicate the range of possibilities in the current print-based paradigm, we focused first on acquiring and building a digital infrastructure to support several modes of publication, including non-peer-reviewed papers (e.g., working papers and technical reports), peer-reviewed papers, and book and journal publication. The eScholarship program supports two basic formats: Adobe Acrobat (PDF) and XML. After some experimentation with assorted technical and organizational approaches, the current eScholarship Initiative coalesced in early 2002, with infrastructure components that span the range of faculty and researcher needs.

Working Papers and Research Reports. The eScholarship Repository [http://repositories.cdlib.org/escholarship/] provides UC departments, centers, and research units direct control over creation and dissemination of the full range of scholarly output, from pre-publication materials through journals and peer-reviewed series, and—beginning in May 2004—posting of legally available UC author's digital copy of commercially published articles.

ABOUT THE CALIFORNIA DIGITAL LIBRARY

The California Digital Library (CDL) supports the assembly and creative use of scholarship for the University of California Libraries and the communities they serve. Established in 1997 as a UC library, the CDL has become one of the largest digital libraries in the world. http://www.cdlib.org/

eScholarship is a project of the California Digital Library at the University of California's Office of the President . It was launched to facilitate innovation and support experimentation in the production and dissemination of scholarship. http://www.cdlib.org/programs/escholarship.html

BREAKING THE BANK: The High Costs of Scholarly Publishing

Scholarly communication has become an international, multi-billion-dollar business. Statistics and facts compiled by the CDL support the case that publishers are 'breaking the system' with pricey pubs and practices that don't properly recognize contributions on the academic side of the equation.

From 1986–2000 the Consumer Price Index rose 57 percent, serial prices rose 227 percent, and book prices rose 65 percent. (Assoc. of Research Libraries).

From 1989–1999 the number of journal titles published increased 58 percent and library journal expenditures increased 170 percent, but the number of titles typically acquired declined 6 percent (source: Assoc. of Research Libraries).

UC faculty serve on the editorial boards of ~15% of top-tier journals; yet UC libraries spent $20 million on print and digital journal subscriptions in 2002–03.

The repository, which debuted in April 2002, enables easy upload of papers into a centralized, managed location that makes the content freely available. UC faculty units are responsible for the review, selection, and deposit of the content, including editorial support for journals and peer-reviewed series; CDL is responsible for maintenance of the digital record.

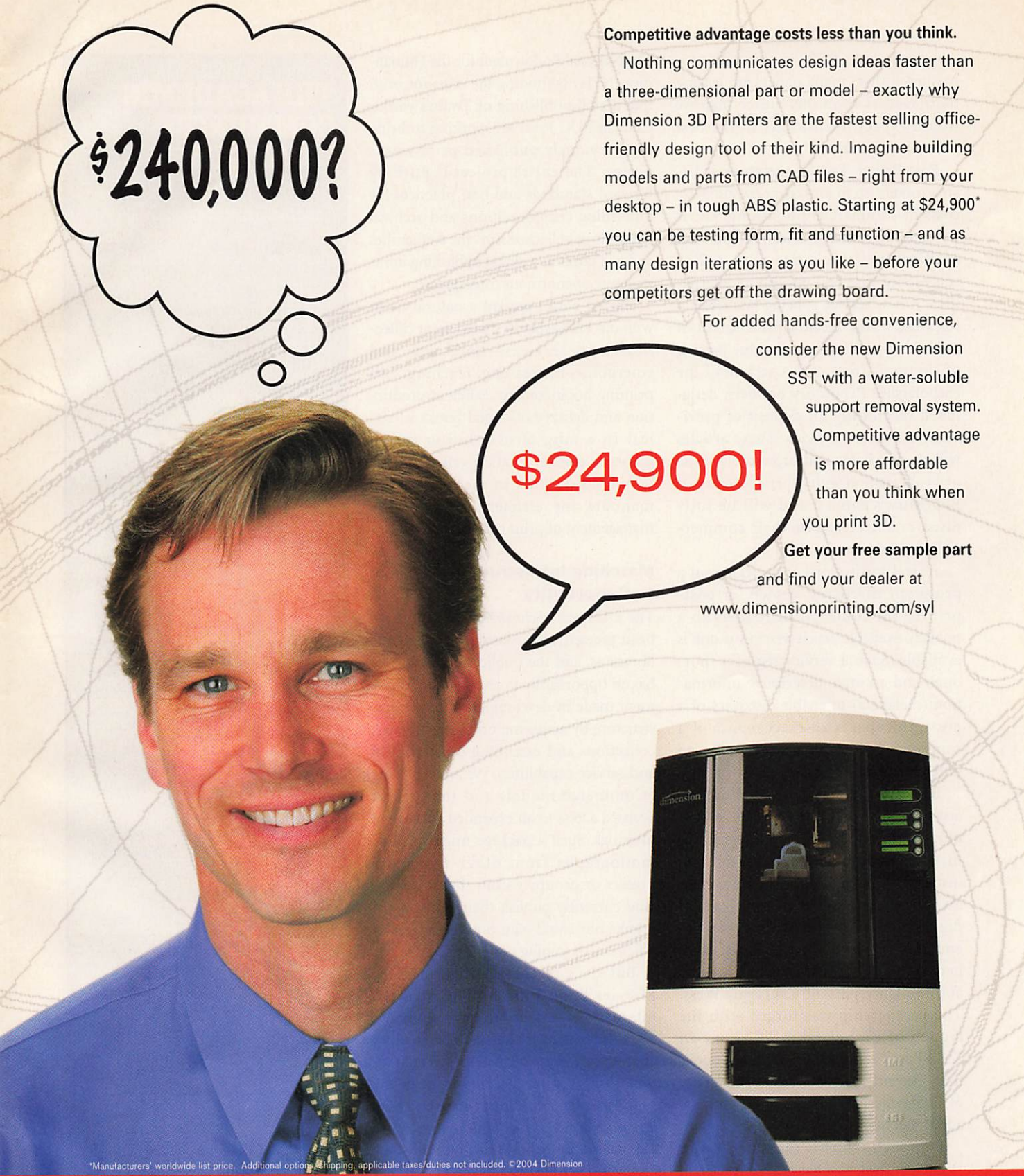
The eScholarship Repository is extremely easy for contributors and readers alike. The technical expertise required to upload and publish papers is minimal. Documents can be provided in a variety of formats (Word, RTF or PDF) and associated materials such as pictures, data sets, and PowerPoint presentations can be posted with the article.

Each program or department has its own uniquely branded site complete with logo and links. Web search engines such as Google can easily crawl and index information about the papers, since each paper is represented by a static Web page with the relevant descriptive information. This information is also available for harvesting through the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH), to enable discovery services such as OAIster (www.oaister.org) to provide one-stop searching of hundreds of similar repositories.

Journals and Peer-Reviewed Series. With the eScholarship Repository's new peer-review capability, UC faculty now have an alternative to publishing their research in for-profit journals, whose rising costs have become such a burden to universities and libraries with shrinking budgets. UC faculty in all disciplines can use the eScholarship Repository to provide free, open access to peer-reviewed journals online.

The CDL expects the number of peer-reviewed papers and journals to grow substantially in coming months, with the addition of scientific monographs and other content from the University of California Press, as well as new journals sponsored by departments at several UC campuses, including *InterActions: UCLA Journal of Education and Information Studies.* Additionally, *Comitatus,* a 34-year-old journal sponsored by the UCLA Center for Medieval and Renaissance Studies, will be migrating to the eScholarship Repository this spring.

As UC faculty and others have joined the movement speaking out against the high cost of many scholarly journals, the eScholarship Repository has seen its numbers grow to nearly 2,800 papers and over half a million paper downloads (not Web hits) since its inception. The repository typically sees download rates well in excess of 10,000 paper downloads per week (with a high of more than 14,000 downloads in one week). Although a few papers tend to be quite popular, usage is spread fairly evenly across the repository, with about 75 percent seeing at least one download in



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any given week. A UC institute director has noted that "many papers are getting more readers from this source than we would expect them to get in the best professional journals."

Post-Prints. Faculty members at UC are virtually up in arms over the runaway costs of commercial publishing. UC is trying to meet their frustration and their enthusiasm for change with policy suggestions and real publishing alternatives. A new service is being launched in response to the recent liberalization of publishing policies regarding the posting of electronic "reprints." A section of the eScholarship Repository has been designated specifically for deposit of previously published articles. These articles will be searchable and browseable alone or in association with other eScholarship Repository papers, and will be fully discoverable alongside their commercially published twins.

Several institutions are working on a prototype discovery service for post-prints that could point readers to a publicly available article version if one is available. Such a service requires thorough and accurate descriptive information (metadata) to enable discovery of a post-print that is an exact replica of a commercially available article as well as to differentiate pre-prints from post-prints.

Books. Books are central to the scholarly enterprise and form the core of UC library collections. In keeping with our mission to support the research and instructional activities of the university, eScholarship is also engaged in a suite of digital book projects that build on the enormously productive collaboration between CDL's eScholarship program and the University of California Press. The partnership was forged with the launch of eScholarship Editions, an XML-based service for publishing books that currently includes 1,500 University of California Press monographs and 500 additional books in process.

One such effort is the Mark Twain Digital Project, a collaboration of CDL, UC Press and the Mark Twain Project at the University of California-Berkeley, that seeks to deliver all of Twain's work online. The National Endowment for the Humanities (NEH) is funding the costs for original digital publishing of Twain's works; CDL and UC Press are working to bring the previously published print works online. The entire project is pushing forward standards and best practices for publishing critical editions and archival manuscript collections in the humanities and will result in a digital publishing infrastructure of enormous consequence.

Digital books present a natural tie-in with our endeavors in shared print collections and services—both new and emerging—for reading, teaching, and printing book content. Efficient production and delivery of digital books is critical to a long-term solution to the scholarly communication crisis because they lend support to the university's mandate for efficient system-wide management of print collections.

Matching Infrastructure to Opportunity

The UC Press *eScholarship Editions* have been greeted enthusiastically by faculty, librarians, and the public, and CDL now has an opportunity to leverage the investment made in developing a robust infrastructure by acquiring other digital book collections and extending our technical and service capabilities. We are exploring eCommerce models and the idea of licensed access to an expanded package of offerings. Such a package might include monographs from other university presses or groups within the university who currently publish their own monographs but could gain both prestige and efficiency by joining our efforts.

But UC's recent negotiations with Elsevier Publishing, which attracted international attention, have animated UC faculty as never before. The faculty's corresponding interest in alternative publishing venues has alerted us to the need to be flexible about where and how to deploy our services to best serve those needs. We are experimenting with new applications of existing projects.

An example is UC Press Monographic series, which has just migrated to the

continued on page 38

THE ACADEMIC COMMUNITY FIGHTS BACK

Faculty, researchers, and librarians have long griped about the high cost of scholarly publishing and the resulting limitations imposed on scholarly communications. Now, they are doing something about it. Below are comments from academics about the recent eScholarship initiatives.

"A free society's support for research universities rests on the assumption that the output of those universities will benefit the society. It follows that the research results must be readily available. And yet, we are participating in a scholarly publishing system that is dominated by commercial publishers who return large profits to shareholders. The price increases and pricing structures imposed by these publishers have the effect of narrowing the selection of information sources in both rich and poor institutions. To change this system will require broad, cumulative change. There is encouraging evidence that this change is beginning."

— Carol Fleishauer, associate director for Collection Services, MIT Libraries

"The eScholarship Repository opens new publishing opportunities—the publication process is cheap, and we can get working papers out more quickly than we would with hard copy."

—Ben Crow, associate professor at UC Santa Cruz

"Participating in the respository has increased our visibility and contributed to the exchange of research in the social sciences. I am especially grateful for the archival benefits. Because the scholarly materials we contribute will be maintained by the CDL for the long-term future, we can better support our faculty affiliates."

—David O. Sears, director of the Institute for Social Science Research and a professor of psychology and political science at UCLA

Dell University

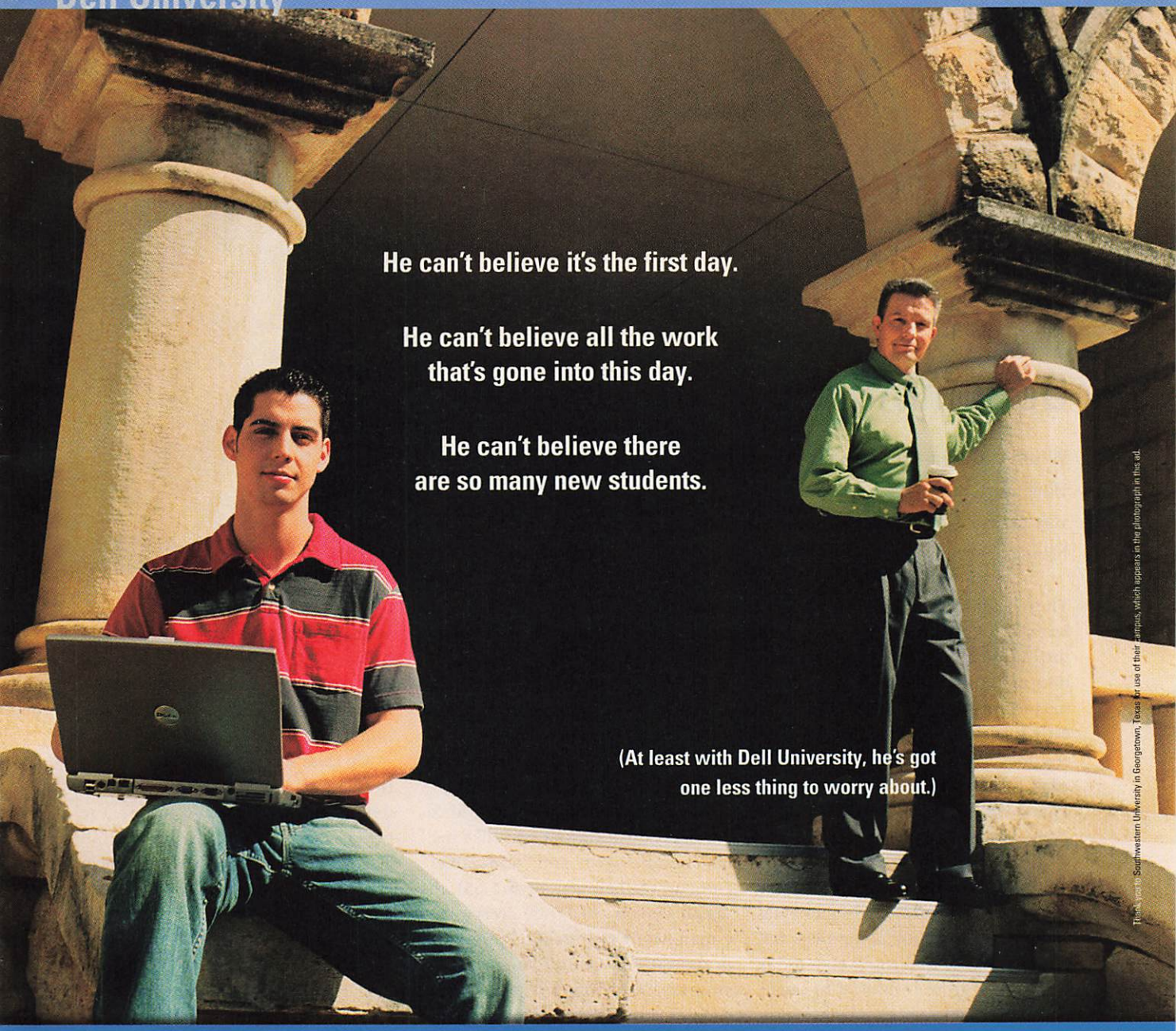
He can't believe it's the first day.
He can't believe all the work that's gone into this day.
He can't believe there are so many new students.
(At least with Dell University, he's got one less thing to worry about.)

Photo courtesy Southwestern University in Georgetown, Texas for use of their campus, which appears in the photograph in this ad.

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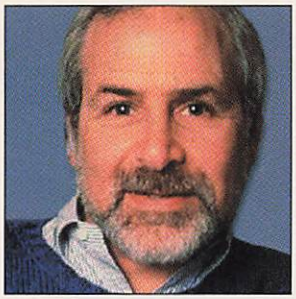
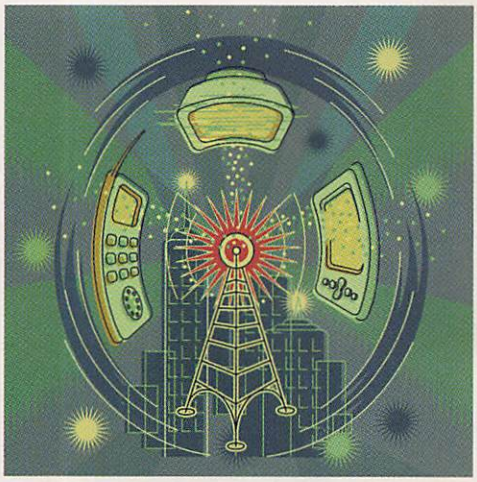


Kenneth C. Green

DIGITAL TWEED



Beginning the Third Decade

When did you buy your first computer? Where did you buy it? How much did you pay for it? When did you send your first e-mail? First visit the Web? Make your first purchase from Amazon? First cite a URL in a blibiography or a course syllabus?

These seemingly simple questions reveal a lot about our individual and institutional odyssey in the world of information technology. The nascent microcomputers of the late 1970s and early 1980s, including the first IBM PCs and Macintosh computers, introduced what Steve Gilbert and I tagged in a 1985 *Change* magazine article as "The New Computing in Higher Education."

It has, indeed, been a journey. Technologies that did not exist or were simply emerging in 1985—personal computers, notebook computers, cell phones, PDAs, and the Web—today have moved from incidental to essential. These technologies, and others now emerging (for example, wireless) have made the transformation from costly conveniences to compelling, inexpensive, and ubiquitous necessities.

We—and our students—want and expect more: more technology tools, more digital content, more resources, *more stuff!*

That said, there is no question that our aspirations for information technology continue to exceed our individual and institutional capacity to innovate with and integrate technology into instruction and operations. The early adopters among us seem to integrate, effortlessly, all the emerging tools and technologies. In contrast, the rest of us are engaged in a continuing game of digital catch-up.

But even as our reach exceeds our grasp, what we can—indeed should—ask is, "how far we have come over the past two decades?" And we should also ask about the distance we have to go.

The easy metrics involve individuals and individual work: if you (like me!) are "middle-aged" and "mid-career" (somewhere between 40 and 65), the digital shadows of IT are everywhere: e-mail, word processing, PowerPoint presentations, course management systems, and instant messaging, coupled with the emerging ubiquity of wireless technologies and video, all serve as constant reminders of how much the work environment in academe (and elsewhere) has changed over the past two decades.

The Web, in particular, has dramatically enhanced, what was until about 1995, the largely unconnected desktop computer. The explosive growth of the Web has provided fingertip (well, keyboard) access to an incredibly rich and constantly growing array of resources that reside well beyond my office and time zone.

But for those of us in academe, there are also the instructional and operational aspects of technology. Here the critical issues are far more difficult to measure: instructional infrastructure and curricular deployment, as well as classroom and organizational impacts and outcomes.

Up close and personal, I think about the experiences of my son and daughter, one a college junior, the other heading off to college in fall 2004. They learned about computers in elementary and middle school, and were sent to the Web for information and resources for their class projects and term papers by the time they hit their teens. Their teachers and professors have used PowerPoint presentations in class and have included URLs in the syllabus. My children have textbooks that include CDs. A course management system seems to be widely used at my son's college.

But are their classrooms—and is the classroom experience—so different from what I experienced as an undergraduate three decades ago? To be sure, some of the physical trappings are different: LCD projectors have replaced overhead projectors and many students take notes on computers or PDAs. But the "in-class, on-task" activities seem remarkably similar to my own experi-

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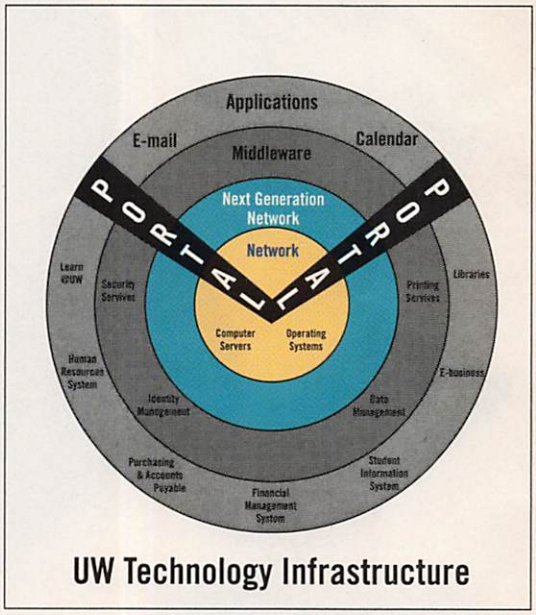
Annie Stunden

CAMPUS ENTERPRISE

The Network: Enterprise Technology Underpinning

Sitting at the core of enterprise campus infrastructure, the network supports myriad information resources and services.



UW Technology Infrastructure

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The network is very much on my mind these days. The network is the real underpinning of the campus enterprise technology environment. Almost everything else we do with technology on our campuses is dependent on a reliable high-speed network. And it really isn't "a" network or "the" network. On most campuses we have a network of networks.

Depending on the campus size, several-to-hundreds of local area networks may be connected to the campus backbone network. A substantial modem pool may also be part of the campus network environment and additionally, the network may support DSL and cable modem service.

In addition to this wired campus network environment with the huge Web of fibre and cable, wireless network capabilities are also now part of our portfolio. And for many of us, the wireless capabilities on our campuses happened when we weren't looking. Someone in a campus department bought a little wireless modem and plugged it in. Folks found it and began to use it. Other folks rolled their own. And so, the wireless environment may have grown like a weed.

Quality of Service (QoS) refers to the capability of a network to provide better service to selected network traffic. The primary goal of QoS is to provide priority to certain network traffic by dedicating bandwidth and controlling jitter, latency, and loss. QoS also assures that priority for selected traffic flows does not make other traffic flows fail.

Next thing you know, you are identified in one of those Web sites that lists free wireless access points in your community, because you have been found in a drive-by. And even as you try to build out a wireless environment that requires authentication and authorization, those rogue wireless hot spots keep popping up. This is an area where campus policy may be helpful. We probably need to batten down the hatches on our wireless networks.

And what are we using this campus network of networks for? In last month's article, I painted a picture of the way we look at our technology environment at UW-Madison. Just about everything we do is dependent on a well-functioning campus network. All of the computers use the campus network for communication. No more SNA network specifically for the mainframe and its terminals—everything is in the Ethernet world.

All of the enterprise applications supported are dependent on the network for getting the information they need and returning the information the user needs. Our back-up and recovery processes are dependent on the network. Our print processes are dependent on the network. Our students and faculty and staff now require the network to go about their work of learning and teaching and research and administration.

On my campus, we are building out a new high-speed network. Our network had not been a campus-coordinated effort, but rather a patchwork of local area networks held together by a backbone that had no idea what it was supporting. Our fibre and cable plant had been installed early and now was not adequate to support a more contemporary, integrated, high-speed

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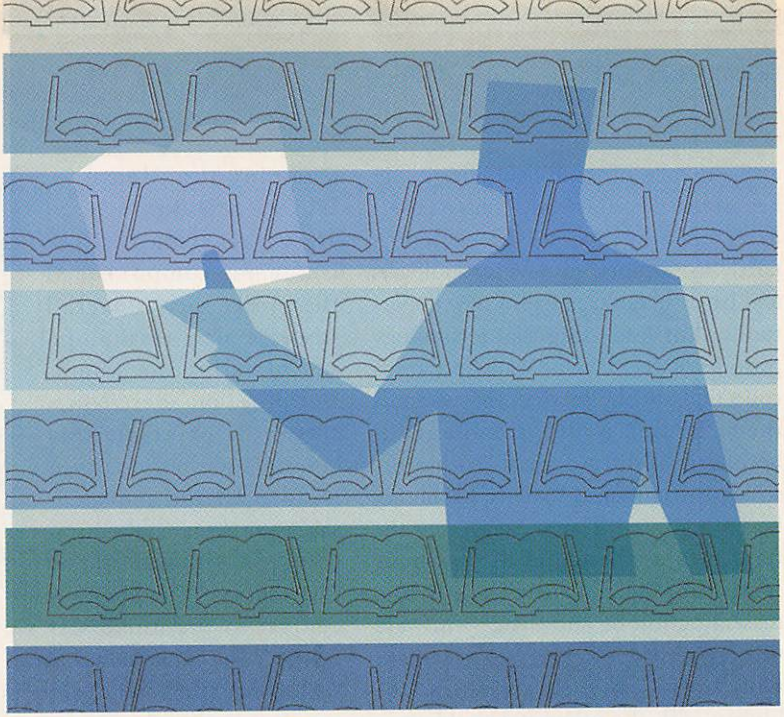

Deep Infrastructure

Supports Digital Library Services

Libraries have always been central to the exchange of knowledge, but never have they been closer to the creation and dissemination of scholarly content, and to the fundamental processes of teaching and learning. Duke University has recognized the strategic importance of the digital library as a change agent.

By Paul Conway, Duke University

Everybody wants a digital library, or so they think. The term "digital library" has become synonymous with technological innovation in higher education. With a decade of support from governments and private foundations in an international context, digital libraries are maturing as both a metaphor for digital collections and services, and as a framework for advances in computer and information sciences. Digital libraries may prove to be tremendous forces for needed change in teaching and learning and, particularly, for the transformation of the roles that traditional libraries play on and off campus. Duke University is embracing digital library services as a strategic mechanism for advancing deep information technology infrastructure on campus.

What is a Digital Library?

Digital libraries emerged from research and development activities in the decade of the 1990s. They are a nearly ubiquitous feature of higher education today and yet they conform to no easy definition. From among the many competing views, Christine Borgman (2000) offers a dual-faceted perspective: a set of electronic resources—constructed and organized for a community of users. Perhaps more presciently, Paul Duguid (1997) focuses on the resources required to advance technology over time. For Duguid, a digital library is "an environment to bring together collections, services, and people in support of the full life cycle of creation, dissemination, use, and preservation of data, information, and knowledge." This definition seems particularly appropriate for a higher education community attempting to balance the flexibility of virtual space with the power that physical space brings to the learning process.

Digital libraries in higher education are tied up in the

evolving roles of traditional libraries. In her extended essay, Wendy Lougee (2002) describes how libraries are changing, partly in response to new technologies and partly in anticipation of new opportunities for leadership that technology provides. Rather than being defined by its collections or the services that support them, Lougee writes, the library is becoming "a diffuse agent" within the scholarly community. "We see the library becoming more deeply engaged in the fundamental mission of the academic institution—i.e., the creation and dissemination of knowledge—in ways that represent the library's contributions more broadly and that intertwine the library with the other stakeholders in these activities. The library becomes a collaborator within the academy, yet retains its distinct identity."

Digital libraries have a life of their own. Daniel Greenstein and Suzanne Thorin (2002) apply the metaphor of human aging (child, adolescent, adult) to the process of building and extending digital library programs. Through a series of case studies, they identify common themes of the maturing process, including the ability of libraries to harness expertise through campus collaboration and to discreetly move resources from traditional library activities to digital research. The most significant mark of maturity, they suggest, is the ability of the research library to embed itself ever more deeply into the scholarly environment and in the change process on campus.

Elements of the Digital Library @ Duke

(1) Easy-to-understand services and tools to help users find and use the library's resources

(2) A unified gateway to the digital resources created or acquired for use in teaching and learning

(3) Physical and virtual workspaces for connecting digital resources with the world of traditional library resources

(4) Networks of experts who build and preserve the library's digital assets

Planning the Digital Library @ Duke

The Digital Library @ Duke is a major component of the university's overall strategic plan. Goal 6 of a key planning document, *Building on Excellence*, states the principle that "information technology is an integral and indispensable component of education and research in the 21st century." The library is central to the university's plan to connect the Duke community to the resources they need anytime and anyplace and to increase support for the use of information technology in teaching and learning environments. The Digital Library @ Duke is intended to support—and eventually help transform—teaching and learning by members of the Duke community.

The library has identified the development of the Digital Library @ Duke as a top strategic activity of its present five-year plan. *Critical Choices: Perkins Library System Plan, 2000-2005* proposes that the digital library will facilitate the transformation of scholarship by "...seizing the opportunities of new technologies to enhance traditional resources and services and to build new roles for the library, presenting it as the resource of first resort for scholars and as the shared intellectual center of the university" (See sidebar).

Early in 2001, a library-oriented planning task force did yeoman work to outline the programmatic and organizational elements of the Digital Library @ Duke. The task force developed a compelling vision for a digital library initiative and identified five strategic recommendations: (1) build an organizational structure to support new digital library initiatives; (2) hire and reassign staff to create a critical mass of expertise dedicated to digital library projects; (3) create a technical infrastructure capable of managing a diverse array of information resources in digital form; (4) pursue outside funding to increase the scale of digital library operations ; and (5) join the Digital Library Federation [http://www.diglib.org/], an active consortium of leading university libraries in the U.S. committed to advancing a critical research program.

Duke Planning Documents and Web Sites

Building on Excellence: The University Plan, 2001. http://www.planning.duke.edu/

Critical Choices: Perkins Library System Plan, 2000-2005. http://staff.lib.duke.edu/plan2kx/

Digital Library Initiatives Task Group Final Report, 2000. http://www.lib.duke.edu/dli/

Duke University Libraries. Information Technology Services. http://www.lib.duke.edu/its/index.htm

The digital library program in the Duke University Libraries comprises services, technology tools, and digital content that support the diverse information needs of the multifaceted Duke community, extending well beyond the physical campus setting.

In this sense, then, the digital library is conceived as a resource environment, accessible through computing tools in buildings on campus and on individual desktops on and off campus. Duke's digital library program becomes the essential mechanism for uniting people and ideas and presenting information that lives across the full spectrum of storage media. In the past decade, the library's digital efforts have moved at an increasing pace from childhood to early adulthood.

Infrastructure Elements

It is important to recognize that a digital library program makes the library buildings on campus ever more critically important, if for no other reason than a library can usually provide—in tandem with central IT capability—a great variety of computer equipment,

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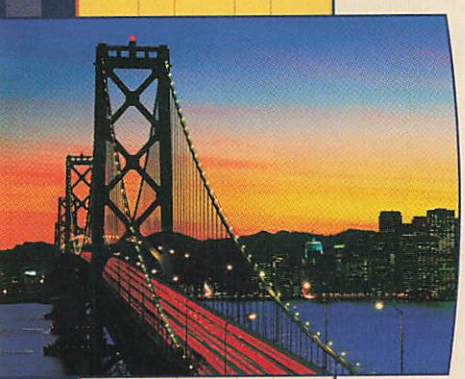
Syllabus 2004

11TH ANNUAL CONFERENCE AND EXHIBITION

JULY 18-22, 2004

HYATT REGENCY EMBARCADERO HOTEL, SAN FRANCISCO
FEATURING A DAY AT UC BERKELEY



A BRIDGE TO THE FUTURE:

TECHNOLOGIES TO CONNECT THE CAMPUS

CONFERENCE HIGHLIGHTS

- A day at UC Berkeley exploring innovative learning technologies, emerging modes of teaching, and collaborative computing environments
- Expert panels and thought leaders with diverse viewpoints on IT's hot topics
- A collegial setting for exchanging information and networking with peers

TRACKS

NEW TECHNOLOGIES AND TRENDS

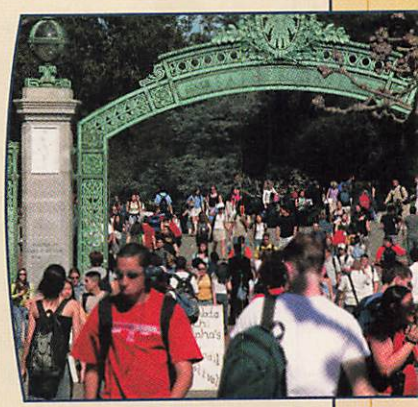
Sample the new and emerging technologies and applications that make a difference in the development and delivery of education.

INTERACTIVE MEDIA

See how new technologies are being used on campus and in distance education and learn more about enabling technologies and standards like SMIL and XML that make it all possible.

IT IMPLEMENTATION AND SUPPORT

Learn what institutions are doing to support faculty development, evaluate technology programs, provide help desk services, and offer resources for technology integration.



Sather Gate, UC Berkeley
Photo by Steve McConnell, UC Berkeley

STRATEGIC PLANNING/ADMINISTRATIVE ISSUES

Delve into strategic planning through discussion of a variety of challenges--infrastructure issues, accreditation of distance learning programs, section 508 compliance, determining return on technology investment, planning for current and future waves of technology, portals, and learning management systems.

TEACHING WITH TECHNOLOGY

Discuss new models of learning, case studies, instructional design standards, technology and student learning with colleagues across the country.

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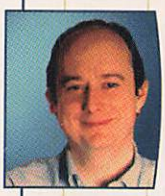
Keynotes

Monday, July 19



Digital Learning Cultures in the Information Landscape

8:30 – 9:30AM

Clifford A. Lynch, Ph.D. — Executive Director, Coalition for Networked Information & Adjunct Professor, University of California, Berkeley

A number of distinct cultures have evolved concerned with the various aspects of IT-enabled learning: "Learning objects" and the repositories that aggregate them are well established; "Learning management systems" (sometimes called "course management systems" or "virtual learning environments") operate on very different levels of abstraction; the entire evolving infrastructure of digital collections, digital libraries and institutional and disciplinary repositories are now struggling to formulate appropriate linkages with the world of digitally-enabled learning; and, finally, the additional perspectives of scholarly communication and records management are demanding recognition. Lynch will examine these sometimes-competing and conflicting points of view and sketch the developing linkages and relationships among them. He will discuss both the prospects for an effective synthesis of these different perspectives and some of the questions that we need to answer in pursuit of such a synthesis.

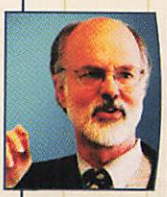
UC's Turbulent Times and the Role of IT

11:05 – 11:45 AM

Kristine Hafner, Ph.D. — Associate Vice President, Information Resources and Communication, University of California, Office of the President

Dr. Kristine Hafner will discuss Information Technology's role in the University of California's roller coaster ride through budget and growth ups and downs since the year 2000. She will also discuss the New Business Architecture report, "UC 2010: A New Business Architecture for the University of California", and how it has guided campus and system-wide IT-related initiatives. Hafner will conclude by reviewing some of the strategic IT-related issues that will likely confront the University of California in the next several years.

Tuesday, July 20



Cognitively Informed Online Course Design

8:30 – 9:45AM

Joel Smith, Ph.D. — Vice Provost and Chief Information Officer for Computing Services, Carnegie Mellon University

Many challenges remain in the delivery of effective technology-enhanced learning in higher education. To realize the potential of web-supported learning environments, it will be necessary to make dramatic changes in course development, informed by relevant findings of contemporary cognitive science and learning theory. Digital learning environments can be instrumented to provide multiple, rich feedback loops to students, instructors, and designers. These efforts should be supported and sustained through promotion of cohesive communities of use that represent a more powerful "scholarship of teaching" with online tools. Smith will present these principles in light of his extensive research and work with Carnegie Mellon University's Open Learning Initiative (OLI), a new approach to making web-based courses openly available to any individual learner.

Wednesday, July 21

Can the Internet Survive?

8:30 – 9:45AM

Jeffrey Schiller — Network Manager, MIT

The Internet was originally designed to permit people to use computers that were far away from them. However it quickly evolved into a powerful means of communication between people. Today, a true "Peer to Peer" network has developed, one on which anyone can communicate with anyone else and everyone may publish or consume information. But, that network is under attack. Viruses, worms and the scourge of spam have compromised its nature and put its very existence at risk. The easiest solutions for dealing with these threats could in the end destroy the core values and essence of the network. Schiller will consider better, though more difficult, strategies for securing the continuing usefulness and effectiveness of the Internet.

Thursday, July 22

Wandering the Technology Universe

8:30 – 9:45AM

Annie Stunden — Chief Information Officer and Director, Division of Information Technology, University of Wisconsin, Madison

Take a trip with Annie Stunden from the core of the technology infrastructure to some of the places on the outer edges of our technology universe as we know it today and can envision it in the next year or two. Stunden will talk about building the base that we wander from and where we might meander as we support our students, faculty and staff. She will also talk about some of the perils we encounter and some of the wonders we find as we explore real possibilities and make them our own.

Panel Sessions

Is Open Source in Your CMS's Future? Monday, July 19, 3:30 – 4:45pm

Moderator: Victor Edmonds, Ph.D. — Director, Educational Technology Services, University of California, Berkeley

As course management systems have matured, they've encompassed wider functionality and integrated with numerous other campus systems. As with most large, complex systems, the unbundling of service and software components may produce greater opportunities for efficiencies and customization. Open source efforts in general, and specifically SAKAI, may be the wave of the future for CMS.

Panelists:

Kathy Christoph — Assistant Vice Chancellor for Academic Affairs, University of Wisconsin, Madison
Charles Kerns — Educational Technology Manager, SAKAI Project, Stanford University
Phillip D. Long, Ph.D. — Senior Strategist for the Academic Computing Practice, MIT
Brad Wheeler, Ph.D. — Associate Professor and BAT Faculty Fellow of Information Technology & Associate Dean for Teaching and Learning Technology, Indiana University
Mara Hancock — Associate Director, Learning Systems, Educational Technology Systems, University of California, Berkeley

Pushing Technology into the Background— Services for Useful Collaborations Tuesday, July 20, 4:30 – 5:30pm

Moderator: William H. Riffee, Ph.D. — Associate Provost for Distance, Continuing and Executive Education, University of Florida

The "gee whiz" factor is gone from the transmission and display of data bits, as well it should be. Today's students can rightfully expect technology to serve their needs effectively and unobtrusively. What are the collaborative tools and services your institution should offer, and how can these applications now operate ubiquitously in the background—behind the walls and in the air? This panel will discuss their views on evolving technologies and services.

Panelists:

Lois Brooks — Director, Academic Computing, Stanford University
William Griswold, Ph.D. — Professor, Department of Computer Science & Engineering, University of California, San Diego
Lonnie Harvel — Director, Computer Enhanced Educational Services, Georgia Institute of Technology

Your Campus and the TEACH Act: Scenarios and Services Wednesday, July 21, 5:00 – 6:00pm

Moderator: Judith Boettcher, Ph.D. — Consultant, Designing for Learning & University of Florida

Come to this session with your questions and suggestions about offering courses online, in view of the TEACH ACT. This panel of experts provides program scenarios and guidelines to help in interpreting the provisions of the Act, including the criterion for e-reserves and also how to cultivate a campus environment that supports faculty and staff knowledge about this important legislation.

Panelists:

Laura Gasaway, J.D. — Director, Law Library & Professor of Law, University of North Carolina, Chapel Hill
John Harwood, Ph.D. — Senior Director, Center for Education Technology Services, Penn State University

Evolution and Innovation in User Support Thursday, July 22, 11:15am – 12:30pm

Moderator: Howard Strauss — Manager, Technology Outreach, Princeton University

Help! There is a growing menagerie of wireless intelligent devices including laptops, PDAs, Blackberry devices, and PDA cell phones on which users expect Web page delivery, email, and the full suite of university applications. Traditional four-year resident students have become the exception rather than the rule. Technological and social changes are radically transforming user support needs. How should IT organizations provide support in this new environment?

Panelists:

F. Meena Lakhavane — Director of User and Educational Services, Carnegie Mellon University
Ricky Telg, Ph.D. — Associate Professor, Agricultural Education and Communication, University of Florida
Mark Veljkov, Ph.D. — Executive Director of Learning, City University OnLine

A Day at UC Berkeley

Syllabus2004 features a day of learning and exploration the University of California, Berkeley, on Monday, July 19.

The Berkeley campus is renowned for its libraries, laboratories, research, and publications, as well as the distinction of its faculty and students.

Included in your registration, this special day on campus affords you the opportunity to see and experience the latest education technology in action, as well as hear from some of the leading scholars on technology in higher education.

Paul Gray, Ph.D., Executive Vice Chancellor and Provost of UC Berkeley will give an overview of Berkeley and some of its programs, followed by Kristine Hafner, Ph.D., Associate Vice President, Information Resources and Communication, University of California, Office of the President, with a special on-campus keynote.

That afternoon you will have the opportunity to participate in a variety of sessions led by UC Berkeley faculty or take a self-guided tour of the campus. For complete details for the entire conference, go to www.syllabus.com/summer2004.

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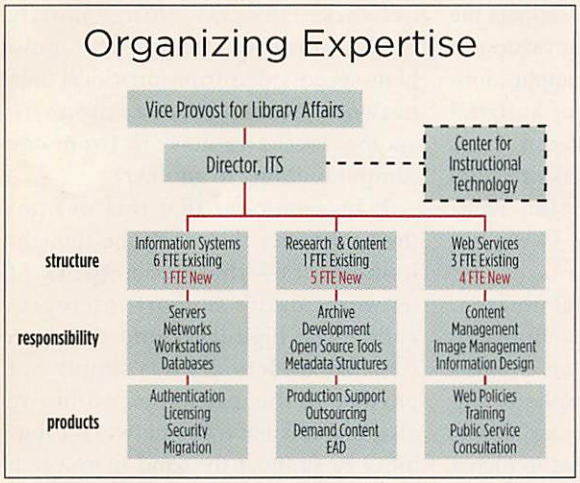

Figure 1. Organizing Expertise

continued from page 20

highly reliable connections to the Internet, and inviting spaces where people can learn together using shared technology tools. Since for the foreseeable future only a part of the information resources needed for most scholarly disciplines will exist in digital form, a digital library becomes the essential mechanism for pulling together and presenting information that resides in the library on paper, film, magnetic tapes, and optical disks.

A deep infrastructure is required to support the services that people see and tend to associate with a digital library. Although every digital library establishes its own identity and a unique mix of content and delivery mechanisms, some infrastructure elements are invariably commonplace.

Organization of Expertise

Organizing a digital library involves assembling expertise, building highly technical computer systems to hold and preserve digital collections, and developing the programs and services that make it possible for people to find and use digital information.

On May 1, 2002, a new organizational structure was put in place under the direction of the Director for Information Technology Services. The Digital Library @ Duke functions as three operational departments: Information Systems Support; Web Services; and Research and Content Development. Each department has a distinctive set of operational responsibilities. All have a specific mandate to serve the public directly and to support library staff in their use of information technologies in their work and in their user services. The three departments work collaboratively on an evolving set of products and outcomes intended cumulatively to give programmatic focus to the digital library. The organizational structure functions as if nearly every technology-related initiative in the library system is related in some way to something we call a "digital library."

This technology department structure represents only those centrally managed digital library resources. The successful development of digital library projects and programs depends on the work of cross-departmental and cross-library task forces, project teams, and advisory groups. The work of seventeen staff members in the digital library organization is leveraged by the work of four times that many staff members working in cross-functional project teams.

Campus IT Relationships

The digital library program at Duke is not an isolated "free agent" on campus but is closely allied with central IT operations and with technology activities based in professional schools and academic departments. The relationship between the library IT operation and the central Office of Information Technology (OIT) can best be characterized as highly collaborative and collegial in that special southern way. The resources that OIT marshals dwarf those of the library. The library's digital initiatives have, as a result, emphasized a principled division of labor that builds on the library's traditional intellectual strengths: structured organization of information resources, a deep commitment to preservation, and mediation in the search and retrieval process.

Another source of strength of the particular Duke context is the presence of the Center for Instructional Technology (CIT) within the library organizational structure. CIT supports faculty innovation with technology and manages the university's course management system (presently Blackboard). CIT gives the digital library program direct access to the very people on campus who are on the front lines of pedagogical innovation.

Digital Library Enterprise Systems

The technical infrastructure of a digital library is built upon a suite of applications that are as fully integrated as technology standards will permit. These digital library applications are being built as enterprise systems managed and promoted not as library systems *per se*, but as tools for the end-user community.

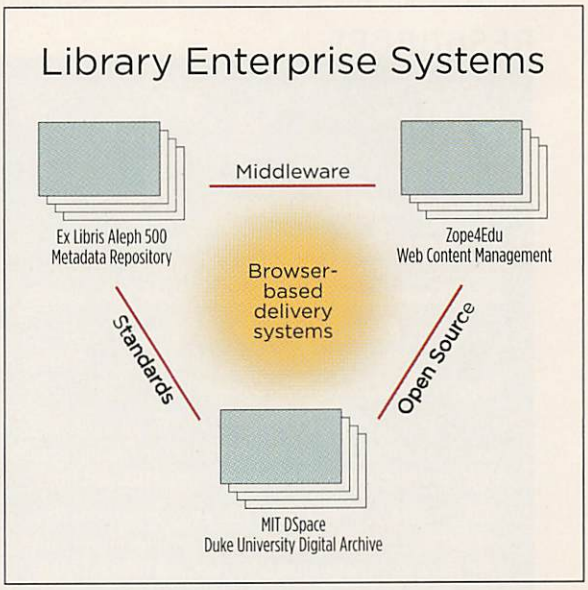

Figure 2. Library Enterprise System

At Duke, three systems are presently under intense development and will be in production starting summer 2004:

- Ex Libris [www.exlibris-usa.com] provides the core metadata repository, as well as a full suite of search and discovery tools and embedded workflow processes that support the acquisition, processing, and delivery of library resources in digital and other formats.
- Zope Corporation [www.zope.com] is developing a Web content management system for Duke built on the open source Zope content management framework. The library is one of two early adopters on campus to rebuild their Web sites and syndicate content with the new product Zope4Edu.
- DSpace [www.dspace.org], open source digital repository software from MIT, is the foundation of an institutional archiving capability.

A Program of Projects

A mature digital library supposedly traverses a path from experiments, to projects, to core operational programs. The digital library program at Duke, as it is maturing, is more accurately portrayed as an integrated "program of projects."

Two of the most significant projects to take advantage of the emerging infrastructure are the creation of a new digital production center to support the digitization and full text conversion of library resources for faculty applications and the implementation of a digital image delivery system from Luna Imaging, Inc. Both projects are fully described on the Information Technology Services Web site [www.lib.duke.edu/its].

Everybody wants a digital library... or do they? Whether you choose to answer that question with an enthusiastic "of course" or an emphatic "no way," the idea of a "digital library" is now a critical intellectual construct in higher education. For some, the idea evokes the mysterious world of bits and bytes and conjures up notions of a library without books, librarians working in cyberspace, and buildings stagnating on campus because students gather and learn online. For others, especially the present generation of students raised with the Internet, digital information is the only way to go. In fact, the digital library of the future is a reflection of the real library of today, albeit one with new tools, new services, and a new perspective on how technology can enhance the learning experience.

Paul Conway, Ph.D. (paul.conway@duke.edu) *is director for information technology services in the Duke University Libraries in Durham, NC.*

RESOURCES

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Campus Enterprise

continued from page 18

network. However, things mostly worked until we attempted to move high-speed video from one local area network across the backbone to another local area network (from one campus building to another).

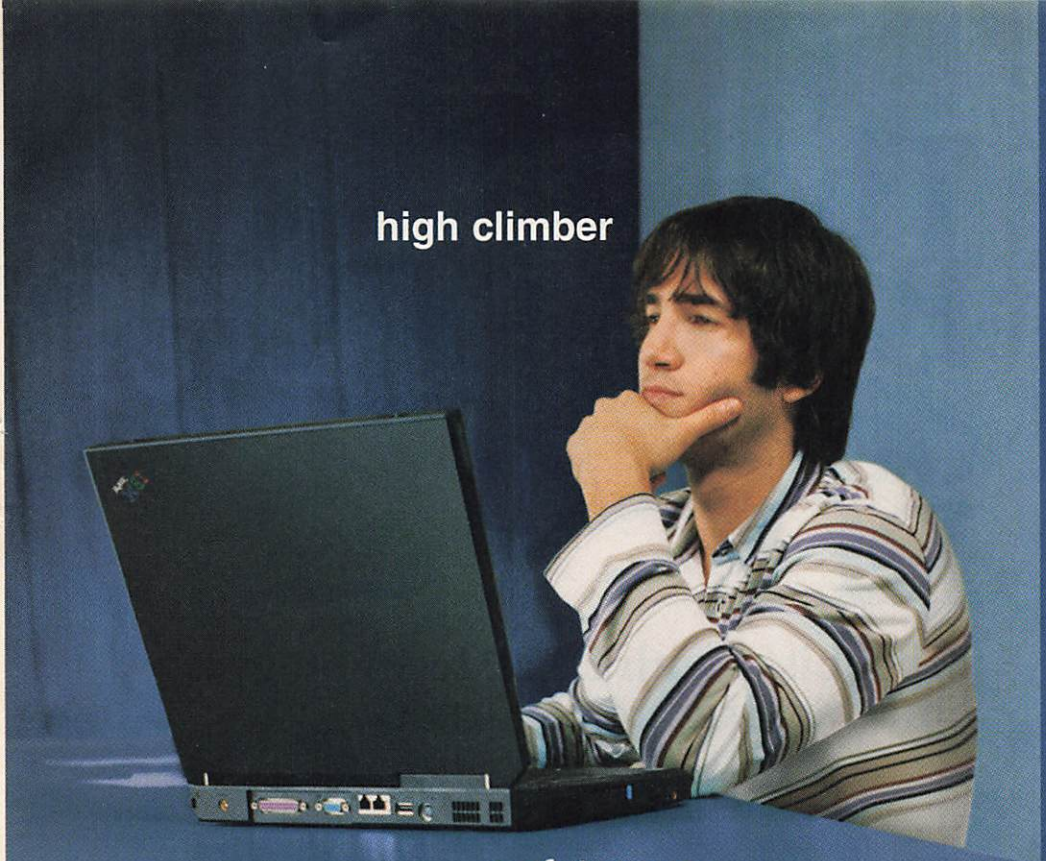
It became clear that this was not the no-brainer that everyone thought it should be—that our network of networks didn't support interoperability at a high level, and that QoS (Quality of Service) was simply not possible in this patchwork world. We also did not have the network capability to support the kind of research that can currently be done effectively in a grid computing environment—an environment important to our campus research community. We had a network for 1990, not for 2000.

Reliability of the network is also critical to the enterprise. In a meeting with our university deans, we discussed whether it was more disruptive for the telephone system or the network to go down. The deans indicated that they were much more dependent on the network, e-mail, and the Web than they were on the telephone. Unfortunately, our phone systems are still more reliable than our networks. We need to work toward that 99.999 percent up time for our networks, with down time carefully scheduled. The Ivory Soap model is not pure enough.

We cannot hesitate to put the necessary resources to planning, building, and managing our campus networks. The rest of our enterprise technology portfolio depends on it.

Next month, I'll write about how our campus network connects to the wide world—our state and regional networks, the Internet, Internet2, and the newest component of the advanced research network infrastructure, National Lambda Rail).

Annie Stunden (stunden@wisc.edu) is chief information officer and director of the Division of Information Technology (DoIT) at the University of Wisconsin-Madison.



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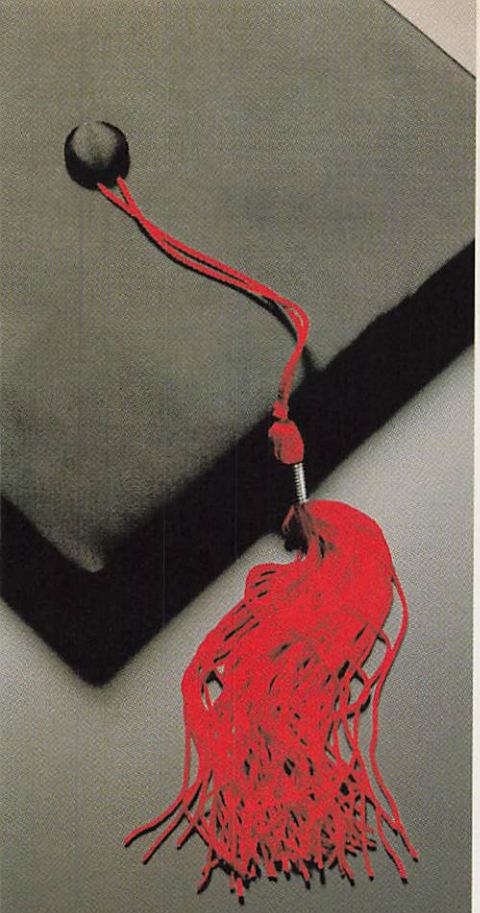

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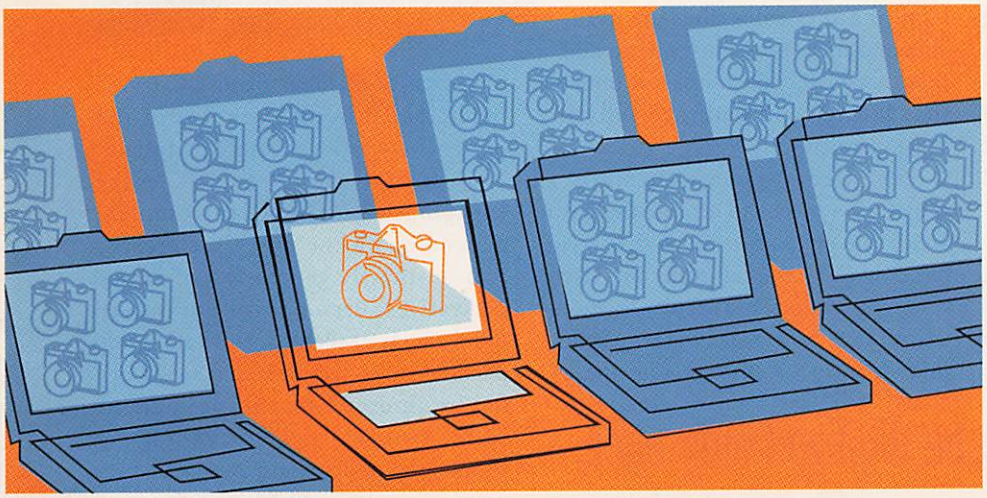


As more information becomes available in digital formats, it's easier to include images in teaching materials...or is it?

By Laine Farley
California Digital Library
University of California

In recent years, large collections of digital images have become available for licensing, and institutions have created a growing body of digital images from their own collections. Subject specialist librarians from The University of California libraries as well as UC visual resource curators advocated for the California Digital Library to acquire several commercial collections of images, create a shared image database, and purchase presentation software for classroom use and formal visual analysis. The CDL has extensive experience in licensing and delivering textual materials such as electronic journals and abstracting and indexing databases, but digital images introduce a range of new issues for management and delivery.

CDL's Image Demonstrator Project

The CDL elected to form the Image Demonstrator Project to deliver images from licensed, freely available, UC-owned images using Luna Imaging's Insight software. The project assembled more than 240,000 images in a six-month period, focusing mostly on images supporting the study of art history, architecture, and cultural studies with a combination of unique research material and canonical collections for teaching. The UC libraries followed the CDL model of co-investing in licensed commercial collections, while two UC collaborative projects—the Museums and the Online Archive of California and the Library of UC Images—contributed unique material. A number of free collections came with the Insight software, contributed by other Insight customers.

While the UC project has specific components, leverages existing organizational structures and partnerships, and focuses on the UC community, the issues are similar to those

encountered at other institutions as they provide digital images to their communities. At the April 2004 meeting of the Digital Library Federation, CDL co-presented with Pennsylvania State University, which has conducted a large-scale research project called the Visual Image User Study (VIUS). We found that except for differences in methodologies and institutional environments, we saw similar incentives, challenges, and unresolved issues. The VIUS project supplies data to back up many of the themes we saw in our small-scale focus groups, surveys, and personal anecdotes.

The CDL project has made progress on all of its stated goals, although a few areas are still under investigation. Some of the original assumptions about benefits and barriers have been borne out, but some surprises emerged as well. Overall, the value of collaboration to expand access, share expertise, and shoulder costs has been affirmed. Most of the challenges have revolved around how to create a productive environment for users.

The Image Demonstrator Project team conducted focus groups with 16 faculty and graduate students from the University of California's Berkeley, Irvine, and Santa Barbara campuses, as well as informal interviews with other faculty who learned of the project. Even though most faculty members were not yet ready to incorporate digital images completely into the classroom, they believed that the use of digital images is inevitable, that there will be a period of parallel use of analog and digital images, and that their students will demand greater access to digital images. One initially skeptical graduate student was impressed enough to predict the death of the slide projector and was proven prescient when Kodak later announced it would no longer manufacture these staples of the art history classroom. Others began to think about how they would use the service, especially for study assignments for students outside the classroom.

Faculty Adoption of Image Services

"Content is king" has long been the mantra adhered to by libraries, and especially cited when it comes to digital images. Many faculty have accumulated their own personal collections to supplement institutional collections in support of their research and teaching interests. Until the core collections are available and there is an easy way to add their personal collections, it is unlikely that faculty will embrace fully the image service.

The Demonstrator project is providing a means to explore these two areas. The mere presence of the service has provided a focal point for visual resource curators and faculty to speculate on how to leverage the core collections held in common across the UC system. The core materials need to be digitized only once, allowing campuses to focus on adding the unique parts of their local collections and research interests to the shared database. While the mechanisms for carrying out such a collaborative effort are still to be determined, the possibilities are now visible. Faculty in the focus groups were pleasantly surprised to find images in their area of interest, but it is still unlikely there is sufficient depth to support all of their needs.

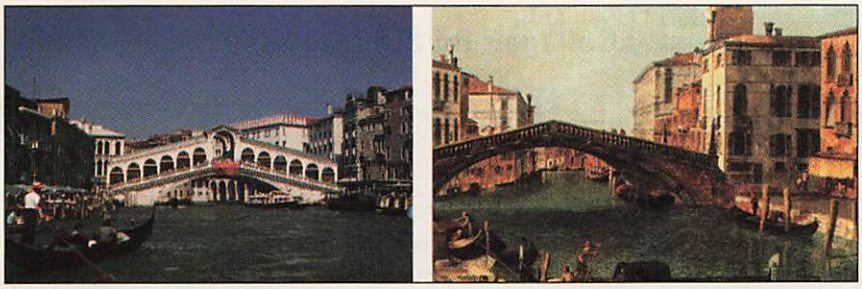
The core materials need to be digitized only once, allowing campuses to focus on adding the unique parts of their local collections and research interests to the shared database.

Image Demonstrator Project Goals

- Conduct assessment of UC faculty and graduate students about using images in instruction and learning, and Insight's ability to meet their needs
- Develop a collection policy and strategy for additions to the service
- Assess workflow issues
- Assess content management capabilities
- Evaluate technical issues related to CDL hosting of Insight, including options for campuses to control different parts
- Evaluate cross-collection searching capability
- Evaluate personal collections feature

A faculty member from UC-Irvine participated in an early test of the personal collections feature of Insight. This feature supports data entry (ranging from simple to complex, depending on the user's preference) and on-the-fly generation of image derivatives. Personal collections are immediately available for use alongside permanent collections, and may later be "promoted" to the permanent collection. While the technology is simple, the policies and support issues can be complex. Again, the Demonstrator project and the flexibility of the software provide a forum for beginning the discussions.

The importance of personal collections and the possibilities for integrating or aggregating them with institutional collections raise a host of policy and support questions. Faculty may not have formal descriptions or standards-based metadata for their collections, but they often have the knowledge to supply this information if others can capture it and standardize it as needed. Faculty are aware of copyright and intellectual property concerns, and seek guidance on appropriate protection of their own rights as well as permitted uses of other images. They are searching for mechanisms to



Specific classroom requirements such as high-quality dual projection systems are among the infrastructure issues encountered with some teaching applications.

share their collections, especially unique research-oriented content, with their colleagues yet protect their creative works and expressions. Librarians, visual resource curators, educational technologists, and others who support research and teaching are struggling to find the best ways to work together and in concert with faculty to support their needs.

Once users have discovered the images they need, they want to use them in different environments—including course Web sites, classroom presentations, or publications. Thus far, the model is for images to be bound fairly tightly to the delivery mechanism. There are options for exporting them to HTML and PowerPoint, and there are possibilities for deep linking to specific images or groups of images from other applications. But concern over intellectual property rights has caused software developers to limit use of the highest quality of images to within the application. The user might gather images from a number of sources for a particular purpose, but currently must settle for either lower-quality images or less capable tools in order to manipulate all images in the same environment.

Infrastructure Issues

Other challenges relate to the issue of "classroom readiness." Art historians have long used dual slide projectors for pictorial study and formal analysis. In order to recreate this approach in the digital environment, it is necessary to install high-quality dual projection systems, pay attention to sightlines, blinds, and lighting, provide a professor's podium with an appropriate computer setup and orientation, and ensure access to on-call technical support. So-called "smart classrooms" often miss the mark by using hotel conference centers or classroom setups appropriate for other disciplines as their models. Technical infrastructure that provides reliable network connectivity, adequate bandwidth, 24-hour access, and off-campus access is also essential. Access anytime, anywhere is an incentive to students and faculty as they fit preparation and study time into busy schedules.

Digital formats and technologies provide the tools, but institutions and individuals must adapt them to their own ways of working, teaching, and learning. As the software and collections of digital images mature, so must our approaches to managing and delivering them to students and faculty whose requirements and creativity in using these resources are usually one step ahead of us.

User Concerns About Digital Images

Faculty who are not yet accustomed to using digital images have cited several common roadblocks in their adoption curve:

- Uncomfortable with technology
- Concerned that technology might not be trustworthy
- Lack of time
- Concern about image quality
- Lack of smart classrooms
- Copyright concerns
- Already have substantial analog collections

Laine Farley (laine.farley@ucop.edu) is the director of digital library services at the California Digital Library, University of California.

RESOURCES

Image Demonstrator Project
A project of the California Digital Library to provide an online service that supports teaching and research with digital images
www.cdlib.org/inside/projects/image/

Insight (from Luna Imaging)
Image management and delivery software
www.lunaimaging.com/insight/index.html

Museums and the Online Archive of California (MOAC)
Digital records and images from California museums and cultural institutions
www.bampfa.berkeley.edu/moac/

Library of University of California Images (LUCI)
The University of California's inter-campus database of digital images for educational use
http://vrc.ucr.edu/luci/index.html

Digital Library Federation (DLF)
A consortium of libraries and related agencies dedicated to digital collection standards and practices
www.diglib.org

Visual Image User Study (VIUS)
Penn State University
A project to assess the needs for interdisciplinary image delivery at Penn State
www.libraries.psu.edu/vius/

- **Cerro Coso Community College** developed a digital library of online classes that students can view at any time.
- **Rivier College** integrated a more streamlined system where instructors can easily create their own content Web pages.

Cerro Coso Community College ▪ By Jim Kiggens

Bridging the Gap—Online and Offline Learning

For residents of California's sprawling Eastern Sierra Corridor, distance learning is often a necessity—not an option. Cerro Coso Community College serves this 18,000-square-mile stretch of mountain, desert and valley communities. It is one of the largest community college service areas in the U.S., with a population base of over 85,000.

The school has five on-ground instructional sites. A sixth site, its online campus, is the largest in terms of enrollment.

Cerro Coso delivers 12 associate degrees online and over 250 distance learning courses a year. Since 2001, our Academy of Media Arts has offered online degrees in digital animation and Web design.

Studying digital animation remotely can be challenging, to say the least. Learning to work as an artist is all about critique. If you're not teaching in a traditional classroom, you need a practical way to post a student's work so that other students can comment and react to it.

Last January we began using Macromedia Breeze to create our digital animation courses. The Breeze system includes several components that can be used together to deliver both live and on-demand Web-based training and presentations. Breeze allows us to add narration, slides, and animation to PowerPoint and deliver this audiovisual material through any standard Web browser.

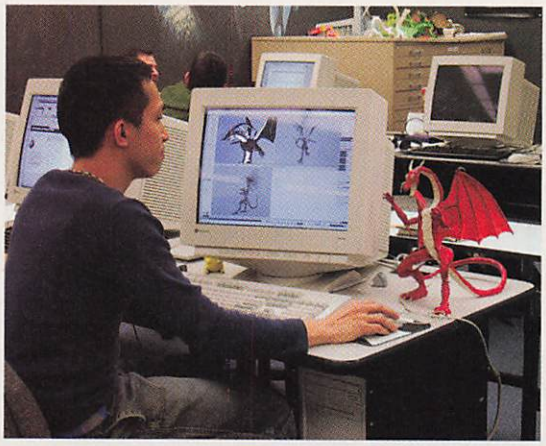


Photo by David Rosenthal

Prem Jalayawongse of Perth, Australia, a member of Academy Session 6 in 2001, is one of eight international students to graduate from the Digital Animation Academy program since 1999.

Breeze Live, a component that extends the Breeze platform with collaborative features like screen-sharing and application-sharing, has completely changed our online classes. Seven evenings a week an instructor hosts a "virtual" open lab, a live, faculty-facilitated study group online.

During these sessions, the instructor answers questions and provides skills demonstrations for the various applications the class is learning to use. These include Softimage XSI, Alias Maya, Adobe Photoshop, and Conitec 3D GameStudio. Students ask questions through the chat window, and the instructor answers the questions via the desktop by going into the screen-share mode.

Prior to the implementation, we had no immediate, cost-effective way to demonstrate techniques students didn't understand. In the past, our only option would be to record the correct answer, burn it onto a CD-ROM, and snail-mail it to the individual student. With 20 or 30 such requests per week, this task was time-consuming and impractical.

Attendance at virtual open labs is not compulsory. We record and archive sessions that are of general interest in a searchable digital library for 24/7 access by all our students. This centralized library also contains individual student projects and presentations.

The Academy of Media Arts has 11 online faculty, all of whom create their own course materials. When I introduced them to the system, it took them about 15 minutes to absorb the information. Admittedly, these were design professionals, but instructors in our other departments also catch on quickly.

The more faculty exposed to this new technology, the more they will undoubtedly dream up new applications. As designers and distance educators, we are constantly seeking affordable, media-rich methods to communicate more effectively with our online students.

Jim Kiggens (jkiggens@cerrocoso.edu) is director of The Academy of Media Arts at Cerro Coso Community College in Ridgecrest, Calif.

Rivier College ▪ By Dan DiCecca

Streamlining Web Publishing

The Web publishing process at Rivier College in Nashua, New Hampshire, prior to September 2003 resembled a funnel: two dozen or more content contributors from our academic and administrative departments funneled documents to the Webmaster's office for posting. The process was a time-consuming and inefficient approach to managing what has become our primary information and communications channel.

Rivier's Web site stakeholders include students, prospective students, faculty, staff, parents, and alumni, all of whom expect us to provide timely, relevant information, calendars of events, and services in order to interact with Rivier—a challenging proposition without the right system in place.

We adopted Ektron CMS200 to enable any faculty or staff member—regardless of their technical ability—to create, manage, and publish Web content. As the Webmaster, I can still control the look and feel of the site and ensure that content is properly reviewed before it gets posted live.

Content no longer faces a "bottleneck" on its way to the Web. Both our internal Rivier users and our site visitors benefit from the change. Internal stakeholders can easily publish timely information, such as academic department course offerings and programs, right from their browsers. Meanwhile, site visitors are assured of finding the most up-to-date information on Rivier's areas of study, contact names and numbers, or calendars of campus events.

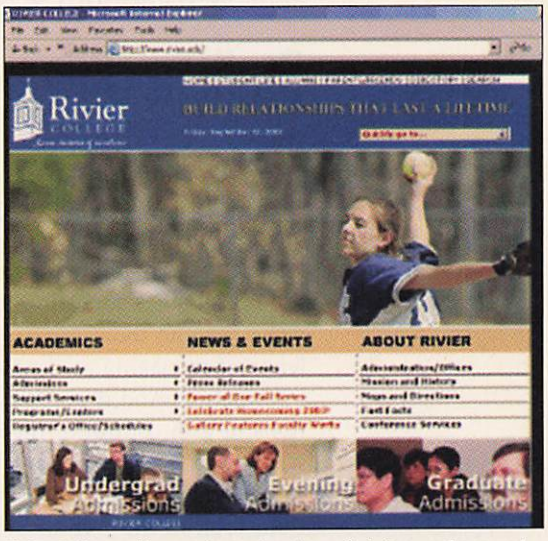
Managing an Increasing Site

Managing the Web site hasn't always been this easy at Rivier College, which serves 1,500 undergraduate and 907 graduate students. Our Web site has always been information-driven. However, the challenges of managing the growing site, combined with the high expectation level of our visitors, led me to search for a content management solution that would simplify this process and allow us to produce a relevant, timely Web site.

Any system had to fit within our modest budget and had to integrate quickly and easily into the existing site, because we have neither the time nor the budget for a lengthy integration cycle. The system had to be easy-to-use and intuitive for non-technical staff, since we cannot regularly support 20 users every time they edit or publish content on our Web site.

The new software offers a high level of content management functionality that has simplified our Web content processes and relieved the content bottleneck. Users easily adopted the software and can use it daily if necessary without interrupting their schedule or making major training investments.

Managing Web content on www. rivier.edu is far easier than it was a few months ago, and the site is more robust and up-to-date. Users are assigned permission to edit and contribute to specific sections of the site. Ektron CMS200's WYSIWYG ("What You See Is What You Get") HTML editor lets users create Web-ready content. The check-in/check-out feature monitors the status of a content block, and I can track content history (who changed content and when). To prevent any accidental errors, content is routed through a flexible, customizable approval chain—with e-mail notifications—for review before it reaches the Web.



Rivier College offers students, faculty, and visitors an improved site, with a simpler navigation and more content.

Approximately 20 users manage content on Rivier's Web site. Individual departments are now preparing, editing, and formatting their own content and submitting it for approval (and I can easily add more users if I need to). Because my users are doing the publishing tasks themselves, I can focus on core IT and administrative tasks associated with the Web site.

Rivier's Web site is a powerful recruiting tool. Prospective students find the information they are looking for. For current students, the Web site is a one-stop-shop for reading about academic programs, faculty information, and other on-campus information. Beyond academics, our Web site delivers information about athletics, campus life, college services, job listings, and faculty policies to a wide audience.

Adopting a Web content management system has eliminated an immense amount of hassle and saved administration time at Rivier College.

Users are assigned permission to edit and contribute to specific sections of the site.

Dan DiCecca (ddicecca@rivier.edu) is Webmaster of Rivier College in Nashua, New Hampshire.

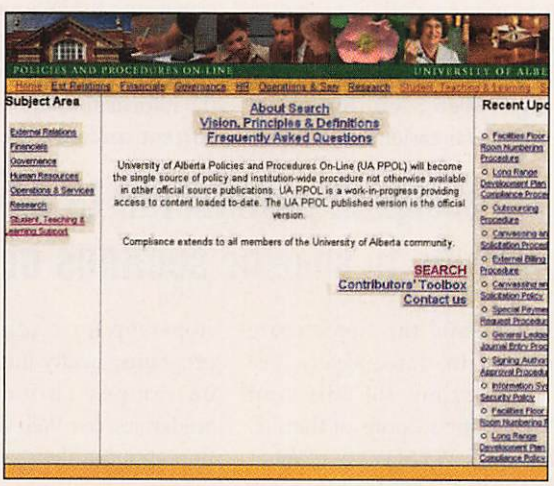
FEATURED PRODUCT ■ STELLENT UNIVERSAL CONTENT MANAGEMENT

Stellent Universal Content Management

Are higher education institutions different from Fortune 500 companies when it comes to managing the critical information and knowledge they hold? Increasingly, the answer is no. Both higher education institutions and businesses around the world are faced with the challenge of managing an overwhelming amount of information. And it is critical for these organizations to gain control of their content in order to serve students, faculty, and staff effectively.

Like many businesses, higher education institutions look to the Web to help meet these needs. Initially, colleges and universities used the Web to recruit prospective students and publish university news. Now, these institutions are using the Web to streamline many of their business processes. Academic departments are developing Intranets to facilitate collaboration, and portals consolidate a variety of information from decentralized departments.

Enterprise content management software systems can help support these content-intensive, Web-based initiatives. Stellent Universal Content Management, from Stellent Inc., is available for both large and small institutions for creating, distributing, tracking, and managing content.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Courtesy of the University of Alberta

The Stellent software system supports five content management elements: Web content management, document management, records management, collaboration and digital asset management, all with a single graphical user interface and platform. It provides higher education institutions the ability to deploy content-centric business applications (e.g., department intranets); meet government mandates, including Section 508 of the Disability Act; and implement enterprise wide initiatives that ensure common, consistent content and content management capabilities are leveraged across multiple sites and applications.

Many institutions have implemented portals as a way for students and faculty to view class information, check e-mail, and look at grades. And, as academic portals continue to grow in popularity, institutions are quickly realizing that the content feeding the portal needs to be centrally managed. Stellent offers integrated solutions, combining portals with Universal Content Management to provide enhanced access, creation, and management of content, while improving the efficiency of distributing that content across the academic institution.

In addition, many colleges and universities have numerous public Web sites, extranets, and Intranets to manage a variety of content, including:

- Enrollment information/student records
- Class recordings/presentations (digital assets)
- Policies and procedures
- Forms, proposals, and contracts
- Building blueprints, drawings, and specifications
- Human resource information, including job postings
- Information technology (IT) documents
- Specialized academic department initiatives
- eLearning support

With Stellent's Web content management capabilities, higher education institutions can maintain Web standards and consistent branding on multiple sites, but leave content creation and editing up to the individual schools or departments, reducing the Webmaster bottleneck and empowering the various site owners.

One academic institution currently using the Stellent system is the University of Alberta in Edmonton. The university first began using the system to organize and manage its policies and procedures, and later for a planning and infrastructure extranet. Akiyah Clements, Express Applications project leader for the University of Alberta, says, "Instead of having hard-copy policies and procedures scattered across campus, the university now has an Internet site that stores protocol from all departments, ranging from administration and

finance to human resources and research." This initiative has reduced confusion for university staff when they are trying to locate the latest policies and procedures, and has decreased the expenses related to these search processes. The extranet, created for planning and infrastructure, provides secure, Web-based access to all building drawings and specifications—including older blueprints, which were scanned into the system—to contractors currently working on university projects. In turn, this solution has dramatically reduced the number of planning meetings and trips to the university required by off-site partners.

The Ohio State University in Columbus is also using Stellent Universal Content Management. The system enables the university's Office of Information Technology (OIT) to access, contribute, and revise information system (IS) documents and to store and manage application code. Previously, OIT IS documents, which include database designs, documents, job operating instructions, disaster recovery procedures, and OIT policies and procedures, were stored as hard copies in rows of file cabinets. Now, the entire collection of documents is stored in the Stellent system and available via a Web-based Intranet. In addition, OIT application code is now stored in an online library managed within Stellent. The search, check- in/check-out, and version control capabilities help users identify and fix problems within the university's computer systems. OIT can pinpoint exactly when code was changed or migrated into the Stellent production environment—ultimately reducing the amount of computer downtime.

In an economy of budget cuts and downsized staffs, institutions must "do more with less." Using a common software platform and interface for all content management applications (i.e., document management and Web content management), allows institutions to easily re-use and share content and content management components among applications.

Stellent's functionality allows the flexibility to expand the system for other initiatives without significant integration time and costs. And, the Stellent system leverages a common skill set across all content management applications, minimizing training and administration costs and facilitating user adoption.

For more information about Stellent, visit www.stellent.com or call (800) 989-8774.

EDUCATOR'S REVIEW ■ BY MICHAEL REECE, DIANA WILLIAMS, AND ANN STOCKS - EAST CAROLINA UNIVERSITY

EyeSpy as a Zooming Platform

As more and more libraries, museums, and archives are converting their resources into digital formats, the need for delivering high-quality, high-detail images quickly and efficiently over the Internet has increased. East Carolina University's Joyner Library is using AXS Technologies' EyeSpy Image Server (www.axstech.com) to address that need along with other issues concerning image delivery for internally created Internet products such as digital exhibits and digital libraries.

Old Technology

Without a product like EyeSpy, repositories tend to rely on solutions that are not well-adapted for serving large quantities of images. The solutions also are either not elegant, or are not full-featured solutions for the end user. Alternative approaches to provide more detailed images include: (1) Implementing a default low-resolution image with a link to a higher-resolution version. This approach often results in a higher-resolution image that is not well adapted for printing or for viewing. That is, it is restricted in its detail in order to fit the lowest common denominator screen or to print on typical end user printers. (2) Creating a set of higher-resolution images that are linked to areas of an image. This approach cannot be batched in production; the manual labor involved means that the solution is not well suited for large quantities of images. (3) Using a browser's built-in magnification capability. This approach makes digitized materials browser-dependent and does not address the issue of speedy delivery to the user of pixel-rich detail.

Current Needs Compared to EyeSpy Features

The zooming requirement for an academic library includes providing faculty, students, and researchers worldwide with unrestricted access to the details of maps, blueprints, genealogical charts, and other oversize materials, as well as details that may exist in smaller items. These materials may be in map collections, manuscript collections, university archives, the general stacks, or may originate from yet unknown future partner institutions. At East Carolina University (ECU), some externally created digital items have been integrated with locally digitized materials to enhance and give access to related materials from multiple repositories. One example is the botanical specimens collected in North Carolina in the early 1700s and archived at The Natural History Museum in London (see examples in Figures 1a and 1b). Sophisticated zooming technologies open the range of materials that can be efficiently considered for digitization. (see map example in Figures 2a and 2b).

Tiling for Efficient Delivery

In choosing a zooming solution at ECU's

Joyner Library, many features were specified and compared among leading zooming software providers. Customers using the technology from various vendors were interviewed. One concern we share with those customers is to deliver zoomed images quickly so that dial-up or otherwise slow connections will not be a problem. EyeSpy uses tiling to accelerate client delivery and, as a result, reduces network congestion.

EyeSpy's tile implementation sends only the user-requested pieces of a large image for zoomed viewing from the image server. When an image is made "zoom-ready," the file is dynamically broken into tiles. When the user clicks on the area to be zoomed, the server instantly sends the minimum number of tiles required to fill the image viewer on the Web page. Each view request transmits a new set of tiles, yet all tiles are served from the same file created upon image ingest, simplifying workflow. Efficient in terms of network and server activity volume, this method of handling view requests also makes the full quality of the original image accessible. The tile feature supports compressed and uncompressed images in over seventy file formats using various algorithms and provides standard JPEG or PNG output to the browser.

Figure 1a- Specimens collected by John Lawson in North Carolina in about 1710, currently housed at The Sloane Herbarium in London.

End User Needs

Another criterion for the selection of a zooming product is that we do not want users to need any special viewers, players, applets, or plug-ins in order to view the images. EyeSpy images are served in pure HTML and can be viewed in any standard browser. This HTML delivery also supports US ADA Sec. 508 IT accessibility initiatives and includes ALT tags for reference images and reader-friendly tags for points of interest within images. Not restricting our user base is an important concern for the library. Another additional EyeSpy feature is the ability to customize the way the zoomed images are delivered to the user, so that we are not locked into the interface provided by the vendor. For example, we want to be able to control the size of the original image and the area in which zoomed images are displayed. We also want to deliver special printing support that does not come with the default packages from the vendor. EyeSpy's pure HTML delivery means that we can add and customize such features.

Zooming Features

All of the basics available in the marketplace are also found in the EyeSpy software: zoom in, zoom out, pan, and reset to original image. Several viewers are available from the vendor, including Basic, Launchpad (as seen in Figure 1a where a marquee is placed around the zooming reference point on a small view of the full original image), and Magnifying Glass viewer. The layout for each of the viewers can be modified, including customizing and rearranging buttons. Being able to give different internal products their own interfaces and graphics while keeping the core usability the same is very appealing. In addition to viewers and graphics modifications, the image output is customizable. Zooms can be served with the number of pixels you want in a specific exhibit by changing the HTML link. This feature allows us to use 200x200 pixel images in one exhibit and 400x300 pixel images in another.

Licensing

Another deciding factor in our choice of this zooming solution was that AXS licenses its software per-server CPU and not per-image. Some vendors license by the number of images that can be zoom-enabled. We did not want to face an expensive process each time we decided on another large project. The EyeSpy license gives us the capability to upload as many images as we have room for on the EyeSpy server without any additional costs.

Figure 1b- Flowering head of Blazing Star; the Latin taxonomic name is Liatris squarrosa (L.) Michaux.

Implementation

When considering zooming server workflow, we wanted to be sure that it would be easy to enable zooming on images. Zoom-enabling means that the original images are moved into the server's folder system and the tiling capability is added to the images. EyeSpy offers a batch import tool which can be set to process at a specified time. This scheduling feature allows an entire directory of images to be zoom-enabled in a batch. One anticipated scenario is that a day's work of scanning can be zoom-enabled overnight.

After installing the EyeSpy server in February, we find that it takes about two minutes per-image to zoom-enable 500MB images (our largest size images currently). This means that the zoom-enabling process for 500 images of about

Figure 2a- Map is digitized from a copy of the Soil Survey of Beaufort County, North Carolina by W.B. Cobb and others.

80MB each (a more typical image size) would occur in less than three hours. EyeSpy efficiently uses available storage by using standard JPEG compression on imported file formats. For example, imported 80MB TIF files to save onto the server at less than 15MB.

At the end of the zoom-enabling process, a report is available on the images imported into the EyeSpy server. The report includes links to the various viewers, which can then be inserted into the relevant Web pages manually or programmatically. Modifications, like pixel dimensions for zoomed images, are made in commands embedded in the URLs in the processing report. We often use PHP scripting for jobs like this.

The EyeSpy server runs on Windows, Linux, and Solaris platforms. Initially we were interested in a Unix-based zooming server in coordination with our other Web services, but the department has recently begun to shift to a Windows environment, so we installed the Windows version of EyeSpy.

Installation was a smooth process that took less than one hour after we upgraded the destination server to the Enterprise Edition of Windows Server 2003.

Tips for Other Academic Libraries

Our library took about a year to define our needs and investigate the marketplace. The process helped us find a solution that confidently meets our immediate and medium-term needs. Take time to compare how various vendors' features fit your organization's needs. If you want to invest in customization, these comparisons along with evaluations of the lives of the companies are valuable. One recommendation is to have the vendors zoom-enable some of your own images, so that you can evaluate features across vendors with images you know well. This research will help insure that internal development work will have a longer-lasting value.

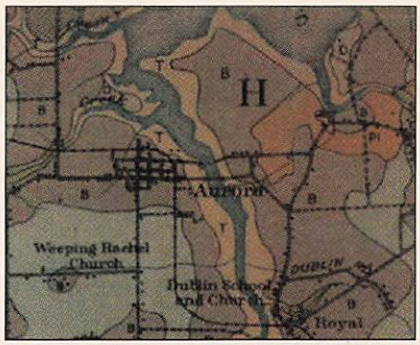

Figure 2b- Zoomed area shows bodies of water, place names, and colors representing various kinds of soil identified.

Michael Reece (reecem@mail.ecu.edu) is production coordinator in the Systems Department at East Carolina University's Joyner Library; Diana Williams is special projects officer at the library; Ann Stocks is an eResources Librarian and is assistant head of the Systems Department.

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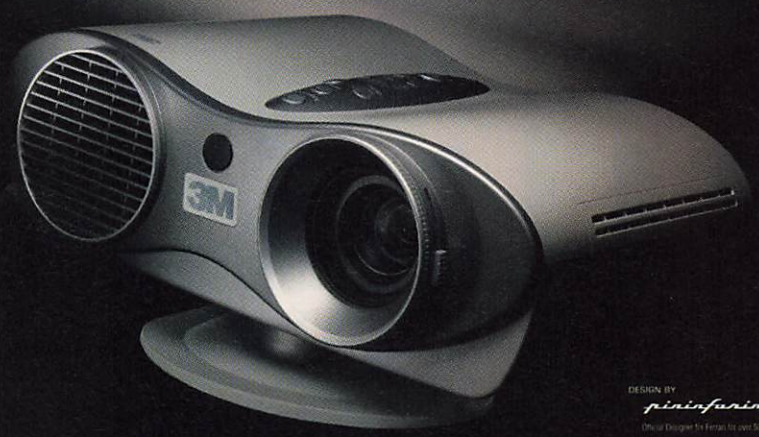

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Digital Tweed, *continued from page 16*

ences as a college student: lectures, group discussion, and student presentations.

So how, then, do we address the continuing questions about technology and instruction? What are the appropriate metrics for tracking the instructional integration of information technology? Number of URLs in the syllabus? Use of a course management system? Online content and assessment? Number of PowerPoint presentations? Hits on the course Web site and average session time?

Do efforts to *quantify* aspects of IT in instruction accurately reflect the all-important *qualitative* dimensions and impact of IT in the curriculum?

These are really important questions. Alas, we in the campus community don't have very good answers. As I stated in last month's column, too often the best we can offer is evidence by epiphany.

So here's my prediction: much as the past two decades have been marked by academe's great aspirations for the role of technology in instructions and operations, this decade may be marked by efforts to make institutions accountable for the continuing (and rising) investment in IT. Inquiring minds—board members and public officials, parents, and even some faculty—will focus on two questions: (1) *Why don't faculty do more with technology?* and (2) *Why don't colleges and universities make better use of information technology in campus operations and services?*

As we enter the third decade of the "computer revolution" in higher education, these seem like fair, timely, and, yes, admittedly difficult questions that we in the campus community will have to address.

***Casey Green** (cgreen@campuscomputing.net) is founding director of The Campus Computing Project (www.campuscomputing.net).*

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For more info visit: http://www.nmc.org

Breaking the System, *continued from page 14*

eScholarship Repository platform. This is a departure from the usual digital publishing path for UC Press monographs, yet it seems a perfect use of the streamlined publishing process of the open access platform.

UC's digital publishing efforts are looking increasingly to the future rather than the past, to publishing what needs to be published (including what hasn't heretofore been getting published) rather than re-formatting what has already been published. And work is underway between CDL and UC Press to develop an all-XML workflow, which will support growing dependence from outsourced compositor/mark-up/conversion services and thus move us closer to sustainability.

Changing the Paradigm

Although CDL has never strayed from its original mission, we now have infrastructure in place that allows us to focus on creating systemic change in the way authors and readers work. We have technologies that allow broader, freer, more creative uses of text and data and we can begin to fashion badly needed services for the classroom, office, and lab.

Increasingly, we respond to the needs of research and teaching, i.e., the needs of individual faculty for publication and dissemination, and the needs of the composite university faculty for access to and preservation of the scholarly record. And, increasingly, we glimpse the possibilities of a world in which the institutions of higher learning regain control of the levers of scholarly communication.

Ultimately, we hope for more alliances of digital libraries, university presses, and scholarly societies—the keepers of the scholarly record within the academy—so as to broaden the effort to serve and preserve the world's knowledge for all humanity. For now, we are thrilled to be part of the awakening.

***Catherine Candee** (catherine.candee@ucop.edu) is director, scholarly communication and publishing initiatives at the California Digital Library, University of California.*

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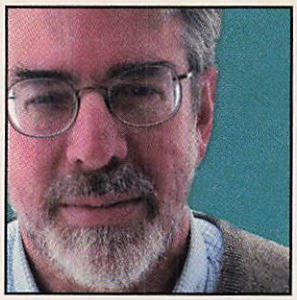


Howard Strauss

REFLECTIONS

ANOTHER LOOK AT EDUCATION TECHNOLOGY

Asking the Hard Questions

One goal of education is to teach students to find answers to challenging questions. The World Wide Web, which is likely the world's largest digital library, has changed how this is done in some surprising ways. For example, many people are certain that if something is not on the Web, it does not exist. If you want to get your ideas and information to them, you must publish your content on the Web. *They* must publish everything on the Web that they wish to share with their colleagues.

Publishing a book or getting an article accepted is a long and arduous task where the accuracy and suitability of the work is often judged by peers and publishers. Something published on the Web is usually reviewed by no one and needs to meet no standards. The Web site www.alienabductions.com, for example, proclaims that "Thousands of individuals are abducted by extraterrestrial beings each year." Information on the Web isn't necessarily true. Even spell checking is likely to be skipped on Web sites.

An economics professor at a western University complained that the Web had caused him to lose control of his undergraduate courses. This was not just a case of students exchanging instant messages or playing Internet games during class instead of being captivated by supply and demand curves. In the halcyon pre-Web days, he said, he was the undisputed expert in his field. He chose the textbooks and other information sources. Papers turned in referenced physical sources with which he was almost always familiar. Now, when GNP, for example, is first mentioned in class, students quickly do a Google search on it. They then bombard him with results from the 590,000 or so hits they get, including www.gnp.org which urges you to fight back against unfettered free trade and the GNP FAQ where GNP of course is an acronym for Gender Neutral Pronoun. Students' papers now reference URLs almost exclusively, which he is not sure are good sources or even exist. And he's not certain how to check them anyway. If a URL doesn't exist, a student is sure to say that it did when she tried it.

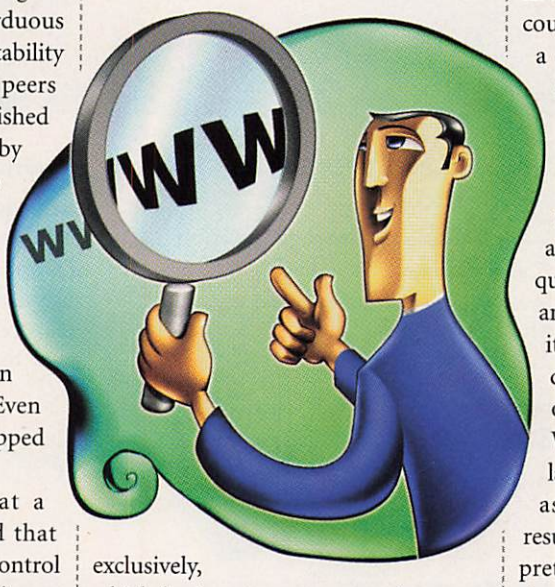


Illustration by Peter Lacalamita

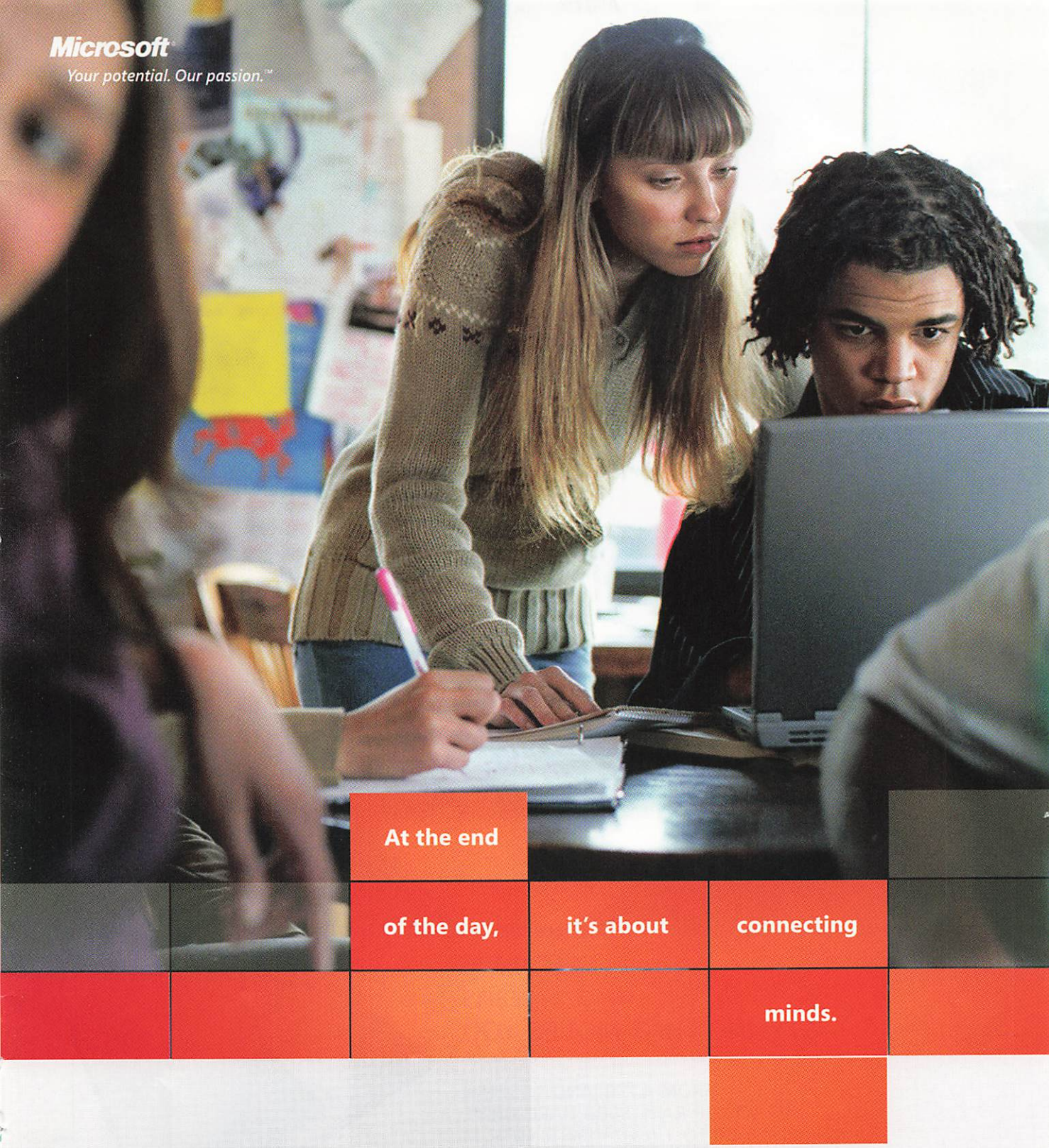
Using a search engine requires more than knowing its syntax, though many Google users don't even know that. How does the Google search *she done me wrong* in quotes differ from the same search without quotes?

Should we prohibit students from using the Web in courses? Of course not, but students need to follow accepted scholarly rules when using the Internet. The APA Style Guide now includes rules for electronic media.

While a professor may not recognize every URL a student references, a savvy professor is not impressed by dozens of even great sources. What's important is how clearly the student integrates the concepts from the course with external material to make a compelling and supportable case for the thesis of a paper.

There are many wonderful things about the Web. It is an open, inexpensive, extensible, public resource that has very wide acceptance. It is very easy to ask the Web questions; just Google a word or two and you get millions of hits. However it is very hard to ask the Web hard questions, not because of any failure of search engines, but because of the Web's structure—some would say lack of structure. Whether the Web is asked easy or hard questions, the results are often very difficult to interpret. In building future digital collections one challenge is to ensure that they are structured to make asking hard questions easy and interpreting the results straight forward. How one does that is itself a very hard question.

Howard Strauss (howard@princeton.edu) *is the manager of technology outreach at Princeton University.*



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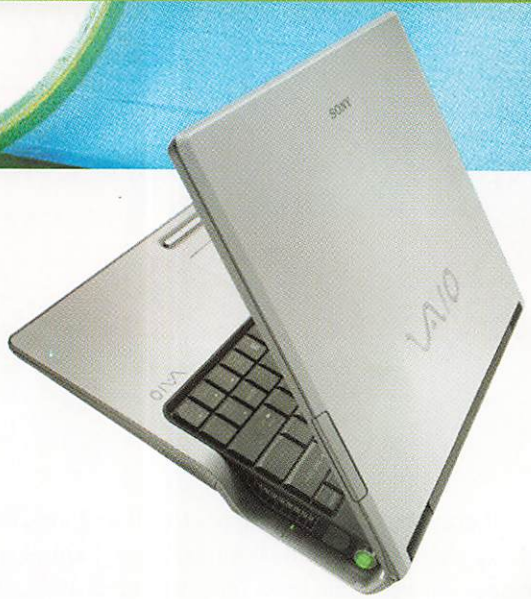

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